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SIX NEW SPECIES OF ALOE FROM ETHIOPIA

By G. W. Reynolds

(With Plates I—XI.)

During April and May 1956, I travelled over 3,000 miles in Eritrea and Ethiopia investigating the Aloes. These countries proved to be rich in Aloe and no less than ten new species were discovered—one in Eritrea, and nine in Ethiopia.

The species in Eritrea was found in numbers a few miles west of Massawa, and also at Arkiko about eight miles south of Massawa, near the Red Sea. This will be described when plants sent to Johannesburg flower.

Three new species from Ethiopia will also be described when they flower in Johannesburg. One was collected at the Ghibie River between Addis Ababa and Jimma, and another between the Ghibie River and Jimma. The third was collected on slopes of the Boli Gorge, overlooking the Muger River on Brigadier D. A. Sandford's farm "Mulu", 35 miles north of Addis Ababa. This is the locality where Dr. E. A. Schelpe discovered it originally.

No less than thirty species of Aloe occur in Eritrea and Ethiopia. This total includes the following six new species now described from Ethiopia:—

A. adigratana Reynolds. Species nova, affinis *A. Campero* Schweinf. (= *A. eru* Berger), caulibus longioribus crassioribusque foliis longioribus dentibus majoribus armatis racemis longioribus plus conicis floribus longioribus minus clavatis differt.

Planta frutescens. *Caules* usque ad 1 met. erecti, vel 1—2 met. decumbentes. *Folia* 16—20, rosulata, ensiformia, patentia, leviter

recurva, 60—80 cm. longa, 15 cm. lata, *supra* basi concava, superne leviter canaliculata, viridia, maculata; *subtus* convexa, viridia, maculata; ad margines dentata, dentibus deltoideis pungentibus 10 mm. longis, 25—35 mm. distantibus armata. *Inflorescentia* 3—5-ramosa, 90 cm. alta. *Racemi* conico-cylindrici, 15—20 cm. longi, 8—9 cm. diametro. *Bracteae* scariosae, 8 mm. longae, 3 mm. latae, 3—5-nervatae. *Pedicelli* 18 mm. longi. *Perianthium* aurantiacum vel luteum, 28—33 mm. longum, cylindraceo-clavatum, circa ovarium 6 mm. diam., hinc trigono-clavatum; *segmenta exteriora* per 15 mm. libera, obscure 3-nervata. *Antherae* 5 mm. exsertae. *Stigma* denum 6 mm. exserta. *Ovarium* 8 mm. longum, 4 mm. diametro. (Plates I, II.)

Ethiopia: Tigre Province, 10 km. west of Adigrat, c. 14° 21′ N., 39° 23′ E., c. 2,700 met., 15 April 1956, Reynolds 8076 holotype (PRE), isotype (K); 19 km. north of Adigrat, c. 14° 21′ N., 39° 25′ E. c. 2,370 met., 16 April 1956, Reynolds 8073 (PRE, K).

Our new species takes its name from the town and district of Adigrat, Tigre Province, Northern Ethiopia, which appears to be its specific centre. *A. adigratana* was found from Adigrat for 20 km. northwards to the Eritrean border at elevations of 2,100—2,600 met. Along the main road to the south considerable numbers were seen 13 to 23 km. from Adigrat at 2,600 met., also at 58 km. near Agula, south of Wogerra (1,800 met.), and on rocky hills near Mekele 124 km. south of Adigrat, at 2,100 met.

On the road westwards over the mountains to Adowa, numbers of plants were observed for the first 10 km. from Adigrat up to 2,700 met. (9,000 ft.), thence at km. 23 (2,500 met.), km. 46 (2,250 met.) and near km. 85 (2,100 met.) which is 20 km. west of Adi Aboun near Adowa; not seen again further west, or north of Adowa.

Below 2,400 met. (8,000 ft.) *A. adigratana* was sometimes found in association with *A. elegans* Tod.; above that altitude and up to 2,850 met. (9,500 ft.) it sometimes occurs with *A. percrassa* Tod.

A. adigratana is nearest allied to *A. Camperi* Schweinf. (= *A. eru* Berger) but differs in having longer thicker stems, longer leaves, longer denser more conical racemes, and much larger but less clavate flowers. The maximum flowering period is March—a month earlier than *A. Camperi.*

Description: *Plants* of shrubby growth. *Stems* up to 1 met. erect, or 1—2 met. decumbent, 12 cm. thick, sometimes with shoots forming small to large shrubs. *Leaves* about 16—20, rosulate, sometimes with the apical 30 cm. of stems subdensely foliate, ensiform, spreading and slightly recurved, 60—80 cm. long, 15 cm. broad at base, 15—20 mm. thick at

PLATE I. *Aloe adigratana* Reynolds.
19 Km. north of Adigrat, Tigre Province, Northern Ethiopia, c. 14° 21′ N., 39° 25′ E., 2,370 m. Fl. 16 April 1956. Stems 1 m. and more long.

FIG. 1.

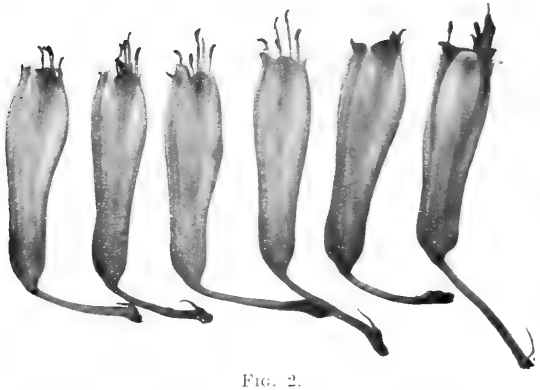

FIG. 2.

PLATE II. *Aloe adigratana* Reynolds.

FIG. 1. Flowers 1/1, from a plant 10 Km. west of Adigrat, Tigre Province, Northern Ethiopia.

FIG. 2. Flowers 1/1, from various plants at random, showing variation—from plants 19 Km. north of Adigrat.

base; *upper surface* concave low down, canaliculate upwards, dull green with numerous pale green lenticular spots in lower third; *lower surface* rounded, dark green with numerous more crowded pale green lenticular spots in basal quarter; *margins* armed with large deltoid pungent reddish to reddish-brown teeth up to 10 mm. long, 25—35 mm. distant; *sap* dries deep brown. *Inflorescence* a 3—5-branched panicle about 90 cm. tall. *Peduncle* basally flattened and 25—30 mm. broad, 3—5-branched from the middle, lowest branch subtended at base by a broadly ovate-acute many-nerved thin scarious bract. *Racemes* cylindric-conical, densely flowered, 15—20 cm. long, 8—9 cm. diam., youngest buds suberect, scarlet with grey-green tips, older buds spreading, open flowers orange to yellow, subpendulous.

Bracts deltoid, thin, scarious, 8 mm. long, 3 mm. broad, 3—5-nerved.

Pedicels averaging 18 mm. long.

Perianth orange or yellow, 28—33 mm. long, cylindric-clavate, basally tapering into the pedicel, shortly stipitate, 6 mm. diam. across the ovary, thence trigonous-clavate, the mouth wide open; *outer segments* free to the middle, obscurely 3-green-nerved, apices subacute, spreading; *inner segments* adnate to the outer to the middle, broader than the outer, orange-keeled, the apices brownish-tipped and more spreading than the outer.

Filaments lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 5 mm.

Stigma at length exserted 6 mm.

Ovary pale green, 8 mm. long, 4 mm. diam.

Native name: *Iret* (Tigrinya).

A. sinana Reynolds. Species nova, affinis *A. Campero* Schweinf., alabastris horizontaliter patentibus vel leviter deflexis differt.

Caulis e basi ramosus, usque ad 1 met. longus 8—10 cm. diametro, adscendens. *Folio* 12—16, rosulata, 10—13 cm. lata, sensim attenuata 60—70 cm. longa, recurvula; supra concaviuscula, apicem versus canaliculata, viridia, maculata; subtus convexa, maculata; ad margines linea rubra cincta, dentata, aculeis deltoideis pungentibus 3—4 mm. longis, 10—15—20 mm. inter se distantibus armata. *Inflorescentia* 4—7-ramosa, usque ad 1 met. alta. *Racemi* 6—10 cm. longi, 8 cm. diam., conico-cylindrici vel subcapitati. *Bracteae* ovato-attenuatae 5 mm. longae, 3 mm. latae, scariosae, 3-nervatae. *Pedicelli* 18—20 mm. longi. *Perianthium* aurantiacum, 28 mm. longum, breviter stipitatum, circa ovarium 6 mm. diametro deinde trigono-clavatum; *segmenta exteriora* per 9—10 mm. libera, obscure 3-nervata. *Antherae* 2—3 mm. exsertae.

Stigma demum 3—4 mm. exserta. *Ovarium* 7 mm. longum 3 mm. diametro. (Plates III, IV.)

Ethiopia. Shoa Province, 18 km. north-east of Debre Sina, *c.* 9° 54′ N., 39° 50′ E., *c.* 1,410 met., 29 April 1956, Reynolds 8126 holotype (PRE), isotype (K, EA).

Our new species is named after the locality where it was found in the largest numbers, namely, on mountain slopes from about 8 km. (5 miles) to 20 km. (12 miles) north-east of Debre Sina, from 1,950 met. (6,500 ft.) down to about 1,410 met. (4,700 ft.). Debre Sina is an Ethiopian village 130 km. (81 miles) north-east of Addis Ababa, situated below the three tunnels of the Pass previously known as Mussolini Pass, on the road to Dessie, at an elevation of 8,500 ft. *A. sinana* was also seen further north at a point 76 km. (47 miles) north-east of Debre Sina which is 17 km. south of Karakora. Certain plants on mountain slopes east of Dessie, on the road down to Kombolchia, growing among *A. Camperi* Schweinf., but not flowering when I saw them, may belong here.

A. sinana seems to be nearest allied to *A. Camperi* Schweinf. in general habit of growth, leaves, and clavate flowers, but differs in having a less branched inflorescence and longer (28 mm.) flowers. It is characterized by having sublaxly flowered cylindric slightly conical racemes with the buds spreading horizontally to slightly downwards. This is a character of *A. elegans* Tod. which occurs north of Amba Alaji and up into Eritrea, but the latter is a large acaulescent plant with grey-green unspotted leaves forming rather compact rosettes, and with a considerably more branched inflorescence.

Some plants of *A. sinana* were observed with shorter denser subcapitate racemes, but in all forms the buds were spreading horizontally to slightly downwards. The only other Aloe species seen between Kombolchia and Debre Sina, mostly in the Rift Valley at about 4,700 ft., were *A. macrocarpa* Tod., and *A. trichosantha* Berger.

Description: *Plants* of shrubby growth.

Stems up to 1 met. long, 8—10 cm. diam., erect or divergent, the apical 20 cm. foliate.

Leaves 12—16, rosulate, basally sheathing, 10—13 cm., broad at base, gradually narrowing to the apex and 60—70 cm. long, spreading to recurved; *upper surface* concave low down, canaliculate upwards, dull grey-green, usually with a few scattered pale green elongated lenticular blotches in lower half; *lower surface* convex, grey-green, with numerous more crowded pale green blotches in lower half; *margins* usually with horny reddish edge armed with pungent deltoid reddish-brown teeth 3—4 mm. long, 10—15—20 mm. distant; *sap* dries deep brown.

Inflorescence a branched panicle about 1 met. high.

Peduncle flattened and 25 mm. broad at base, terete upwards, 4—7-branched from about the middle.

PLATE III. *Aloe sinana* Reynolds.

Plant × 1/10 approx., 18 Km. (11 miles) north-east of Debre Sina (on the Addis Ababa—Dessie road), Shoa Province, Ethiopia.

FIG. 2.

FIG. 1.

PLATE IV. *A. sinana* Reynolds.

FIG. 1. Raceme × 1/4 approx.

FIG. 2. Flowers 1/1, from bud to post-pollination stage.

PLATE V. *Aloe berhana* Reynolds.

9 Km. south-west of Debre Berhan (121 Km. north-east of Addis Ababa), Shoa Province, Ethiopia, c. 9° 40′ N., 39° 40′ E., c. 2,670 m., fl. 29 April 1956. Height 1·20 m.

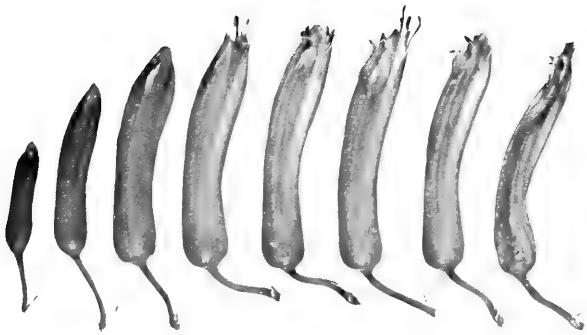

PLATE VI. *Aloe berhana* Reynolds.
Flowers 1–1, from bud to post-pollination stage.

Racemes sublaxly flowered, varying from somewhat broadly conical 6—10 cm. long, 8 cm. diam., to sub-capitate, the youngest buds spreading horizontally to slightly downwards, open flowers nutant, young racemes at first conical, with development becoming somewhat corymbose.

Bracts ovate-attenuate, 5 mm. long, 3 mm. broad, thin brown scarious, 5-nerved.

Pedicels 18—20 mm. long, mostly spreading with apices nutant.

Perianth orange-scarlet near base, paler at mouth, slightly clavate, averaging 28 mm. long, basally obconic and shortly stipitate, 6 mm. diam. across the ovary, thence trigonous-clavate, the mouth wide open; *outer segments* free to the middle, obscurely 3-nerved, apices subacute, slightly spreading; *inner segments* pale orange, broader than the outer, with 3 crowded nerves forming a pale orange keel, the apices more obtuse and more spreading than the outer.

Filaments pale lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 2—3 mm.

Style pale lemon, with *stigma* at length exserted 3—4 mm.

Ovary yellowish-green, 7 mm. long, 3 mm. diam.

A. berhana Reynolds. Species nova, affinis *A. percrassae* Tod., racemis capitatis floribus longioribus differt.

Planta succulenta, acaulis vel breviter caulescens. *Folia c.* 24, dense rosulata, patentia, recurvula, 50—60 cm. longa, 15 cm. lata, sensim attenuata; *supra* basi concava, superne leviter canaliculata, *subtus* convexa, *utrimque* viridia, immaculata, marginibus dentibus brunneis deltoideis 3—4 mm. longis 15 mm. distantibus armata. *Inflorescentia* paniculata, *c.* 15-ramosa, *c.* 1 met. alta. *Racemi* sub-capitati, 6—8 cm. longi, 6—7 cm. diametro. *Bracteae* anguste ovato-acuminatae, 8 mm. longae, 3 mm. latae, scariosae, 1—3-nervatae. *Pedicelli* 12—15 mm. longi. *Perianthium* coccineum, 30—35 mm. longum, cylindricum leviter curvulum, circa ovarium 8 mm. diametro; *segmenta* exteriora per 9 mm. libera, interiora latiora obtusiora. *Antherae* 2—3 mm. exsertae. *Stigma* demum 3 mm. exserta. *Ovarium* 7 mm. longum, 3 mm. diametro. (Plates V, VI.)

Ethiopia: Shoa Province, 9 km. south-west of Debre Berhan (121 km. N.-E. of Addis Ababa), *c.* 9° 40′ N., 39° 40′ E., *c.* 2,670 met., 30 April 1956, Reynolds 8135 holotype (PRE), isotype (K).

Our new species is named after the locality where I found it in large numbers, namely on rocky slopes west of the main road 2 miles and 6 miles south-west of Debre Berhan which is 80 miles and 76 miles north-east of Addis Ababa on the road to Dessie, at 8,900 ft. Plants observed 27 miles from Debre Berhan (9,300 ft.), and 10 miles further south-west

(8,700 ft.) were not flowering but appear to belong here. I subsequently found several plants in flower 36 km. (22 miles) north of Addis Ababa on the road to the Blue Nile and Debra Markos at 8,100 ft., and also further north above Boli Gorge on Brigadier Sandford's farm "Mulu" which is 34 miles north of Addis Ababa. These had slightly longer racemes with shorter (30 mm.) flowers, and are forms of *A. berhana*, not of *A. percrassa* Tod.

A. berhana is nearest allied to *A. percrassa* Tod. which I have seen in large numbers near Dessie, near Mai Chau, on Amba Alaji, west of Adigrat, and further north on the Kohaito Plateau between Senafe and Adi Caieh in Eritrea—but not below 8,000 ft. *A. berhana* is a slightly smaller plant with little or no stem, and subcapitate racemes with curved-cylindric flowers 30—35 mm. long. *A. percrassa* is a larger plant with thick decumbent stems, longer narrower racemes and short cylindric flowers averaging only 20 mm. long, and not curved.

A. debrana Christian in *Fl. Plants S. Afr.* 26: Plate 1016 (1947) was described from west of the main road south-west of Debre Berhan, but I found no plants fitting the description at that locality. All plants still in flower on 30 April 1956 bore subcapitate racemes with 35 mm. curved-cylindric flowers. *A. debrana* as described with 11 cm. cylindric-acuminate racemes, and red perianth only 22 mm. long is clearly a form of *A. percrassa* Tod. and should be reduced to synonymy.

The main flowering period of *A. berhana* is February—March.

Description: *Plants* mostly solitary, rarely in small groups, acaulescent or with short procumbent stem.

Leaves 24 or more, densely rosulate, spreading, slightly recurved in upper third, 50—60 cm. long, 15 cm. broad, gradually narrowing to the apex; *upper surface* unicoloured green without spots or markings, flat low down, slightly channelled upwards; *lower surface* convex, similar to upper surface; *margins* with horny reddish-brown edge armed with reddish-brown teeth that are pungent deltoid, 3—4 mm. long, about 15 mm. apart.

Inflorescence a many-branched panicle 1 met. or more high.

Peduncle basally plano-convex and 3—4 cm. broad, about 15-branched from the middle or lower, the lowest branch with 2—3 branchlets.

Racemes subcapitate, the terminal 6—8 cm. long, 6—7 cm. diam., rather densely flowered, youngest buds suberectly spreading, older buds horizontal, open flowers nutant to subpendulous.

Bracts narrowly ovate-acuminate, 8 mm. long, 3 mm. broad, thin, scarious, 1—3-nerved.

Pedicels 12—15 mm. long, the colour of the perianth.

Perianth scarlet, paler at mouth, 30—35 mm. long, cylindric, slightly

PLATE VII. *Aloe monticola* Reynolds.

On mountain slopes 7 Km. north of Mai Chau, Tigre Province, Northern Ethiopia. c. 21° 41′ N., 39° 47′ E., c. 2,460 m. 27 April 1956. Height 1·30 m.

FIG. 1.

FIG. 2.

PLATE VIII. *A. monticola* Reynolds.

FIG. 1. Flowers 1/1, from bud to post-pollination stage—yellow flowers.
FIG. 2. Flowers 1/1, from a plant with red flowers.

curved, basally obtuse and very shortly stipitate, 8 mm. diam. across the ovary, thence trigonous and very slightly narrowed on the underside only; *outer segments* free for 9 mm., obscurely 3-nerved, apices subacute slightly spreading; *inner segments* broader than the outer, pale yellow with scarlet keel, the apices more obtuse and more spreading than the outer.

Filaments pale lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 2—3 mm.

Stigma at length exserted 3 mm.

Ovary pale green, 7 mm. long, 3 mm. diam.

A. monticola Reynolds. Species nova, affinis *A. elegans* Todaro, alabastris suberectis bracteis magnis obtectis perianthio longiore pedicellis longioribus differt.

Planta acaulis. *Folia* 24—30, dense rosulata, lanceolato-attenuata, patentia, recurvula, 60—70 cm. longa, 14—16 cm. lata; *supra* basi concava, superne leviter canaliculata, viridia, immaculata; *subtus* convexa, immaculata; ad margines sinuato-dentata, dentibus brunneis pungentibus 6 mm. longis, 10—15 mm. distantibus armata. *Inflorescentia* paniculata, *c.* 1 met. alta, *c.* 8-ramosa. *Racemi* subcorymbosi, 6—8 cm. longi, 8 cm. diametro. *Bracteae* magnae, 15—20 mm. longae, 6—7 mm. latae, scariosae, 5—7-nervatae. *Pedicelli* 15—20 mm. longi. *Perianthium* luteum vel rubrum, cylindrico-trigonum, 38 mm. longum, circa ovarium 8 mm. diametro; *segmenta exteriora* per 14 mm. libera, obscure 3-nervatae. *Antherae* 5—6 mm. exsertae. *Stigma* demum 8 mm exserta. *Ovarium* viridulum, 7 mm. longum, 3 mm. diam. (Plates VII, VIII.)

Ethiopia. Tigre Province, mountain slopes 7 km. north of Mai Chau, *c.* 12° 41′ N., 39° 47′ E., *c.* 2,460 met., 24 April 1945, yellow flowers, Reynolds 8118 holotype (PRE), isotype (K, EA); red flowers, Reynolds 8117 (PRE, K).

This very distinctive new species occurs in the high mountains of northern Ethiopia from upper northern slopes of Amba Alaji to south of Adishew, and to about 3 miles south of Mai Chau (Mai Chew), a distance of about 45 miles (72 km.). The largest numbers were found on mountain slopes of volcanic rock 4 miles north of Mai Chau at a point 112 km. (70 miles) south of Mekele and 268 km. (165 miles) north of Dessie, at an elevation of 8,200 ft. (2,360 met.), with numbers of *A. percrassa* Tod. nearby.

The altitude range appears to be from 7,900 ft. to 8,500 ft. (2,370—2,550 met.), while yellow flowers were more frequent than scarlet.

A. monticola is a most attractive and distinctive species characterized

by having large olive-green somewhat glossy leaves with prominent horny brown margins, and paler brown teeth that are longest (6 mm.) at the middle of the leaf. The bracts are 15—20 mm. long, while the perianth averages 38 mm. in length. Racemes are at first slightly conical with suberect buds covered by large densely imbricate bracts. With development, racemes become rather flat-topped, the young buds remaining suberect.

A. monticola seems to be nearest allied to *A. elegans* Tod. (which grows from the northern foot of Amba Alaji northwards to Eritrea where it is abundant) but the latter has grey-green leaves that are never glossy, shorter pedicels, bracts and flowers, while in racemes the young buds always spread horizontally to slightly downwards.

Description: *Plant* succulent, large, with little or no stem, usually growing singly.

Leaves 24 or more, densely rosulate, lanceolate-attenuate, spreading, slightly recurved near apex, 60—70 cm. long, 14—16 cm. broad at base; *upper surface* olive-green and somewhat glossy, unicoloured, flat low down, slightly canaliculate upwards; *lower surface* convex, unicoloured olive-green, rather glossy; *margins* sinuate-dentate, with very prominent brown horny edge armed with paler brown teeth that are deltoid, pungent, 6 mm. long at middle of leaf, smaller towards apex and base, 10—15 mm. distant. *Sap* dries brownish.

Inflorescence a branched panicle 1 met. high, 2—4 simultaneously.

Peduncle basally plano-convex and up to 3 cm. broad, rather compactly about 8-branched from the middle or lower, the lowest branch sometimes 1—3 rebranched and subtended at base by a scarious many-nerved ovate-acute bract about 25 mm. long, 20 mm. broad.

Racemes subcapitate, at first slightly conical, becoming sub-corymbose, 6—8 cm. long, 8 cm. diam., youngest buds suberect and hidden by densely imbricate bracts, older buds spreading, open flowers nutant.

Bracts lanceolate long-pointed, 15—20 mm. long, 6—7 mm. broad, thin, scarious, brownish, 5—7-nerved.

Pedicels 15—20 mm. long.

Perianth mostly yellow, sometimes bright scarlet, averaging 38 mm. long, cylindric-trigonous, basally flat to slightly rounded, 8 mm. diam. across the ovary, exceedingly slightly constricted above the ovary thence trigonous, the mouth wide open; *outer segments* free for 14 mm., obscurely 3-nerved, the nerves greenish, apices subacute, spreading to revolute; *inner segments* free but dorsally adnate to the outer for 22 mm., broader than the outer and with 3 crowded nerves forming a keel, the apices more obtuse and more spreading than the outer.

Filaments pale lemon, the 3 inner narrower and lengthening before

FIG. 1.

FIG. 2.

PLATE IX. *Aloe harlana* Reynolds.

FIG. 1. Plant × 1/10 approx., near Harla, 9 miles south-east of Dire Dawa on road to Harar, Ethiopia.

FIG. 2. Flower 1/1, post-pollination stage.

the 3 outer with their *anthers* in turn exserted 5—6 mm.

Stigma at length exserted 8 mm.

Ovary green, 7 mm. long, 3 mm. diam.

A. harlana Reynolds. Species nova, affinis *A. monticolae* Reynolds, racemis longioribus cylindrico-acuminatis differt.

Planta acaulis vel breviter caulescens. *Folia c.* 24, dense rosulata, lanceolato-attenuata, patula vel recurvula, 50 cm. longa, 12—15 cm. lata; *supra* viridia, immaculata, basi planiuscula, superne leviter canaliculata; *subtus* convexa; ad margines sinuato-dentata, dentibus brunneis pungentibus 3—4 mm. longis, 10—15 mm. distantibus armata. *Inflorescentia* 6—8-ramosa, usque ad 70—90 cm. alta. *Racemi* cylindrico-acuminati, 15—20 cm. longi, alabastris suberectis bracteis magnis obtectis. *Bracteae* late ovato-acutae, 10 mm. longae, 7 mm. latae, 5-nervatae. *Pedicelli* 15 mm. longi. *Perianthium* rubrum, 33 mm. longum, carnosulum, cylindrico-trigonum, circa ovarium 11 mm. diametro; *segmenta exteriora* per 10 mm. libera. *Antherae* per 3—4 mm. exsertae. *Stigma* demum 5 mm. exserta. *Ovarium* 7 mm. longum, 3·5 mm. diametro. (Plate IX.)

Ethiopia. Harar Province, near Harla village, 9 miles S.E. of Dire Dawa on the Harar road, *c.* 9° 30′ N., 41° 52′ E., *c.* 1,650 met., 8 May 1956, Reynolds 8158 holotype (PRE), isotype (K).

Our new species was found at the village of Harla, 9 miles south-east of Dire Dawa on the road up the mountain to Harar, at 5,500 ft., and for 2 miles further on up to 6,000 ft. At lower altitudes *A. harlana* was mostly in bud on 8 May 1956, and grew in association with *A. Mcloughlinii* Christian (see *Fl. Plants Afr.* 28: Plate 1112 (1951)) and *A. megalacantha* Baker (= *A. magnidentata* Verdoorn et Christian).

Larger plants, with rosettes 60—70 cm. in diameter, were found at 6,000 ft., but there was no sign of flowers. It seems that at higher altitudes this species flowers in July—August, and in May—June lower down.

A. harlana appears to be nearest allied to *A. monticola* (described above) in size of leaves and horny leaf margins, and branching of inflorescence, but differs in having slightly smaller bracts, shorter flowers, and especially in cylindric-acuminate racemes 15—20 cm. long.

The peduncle in *A. harlana* is marked below the first branch with many very narrow elongated pale green lines that are broken at intervals. This is a character of *A. Mcloughlinii* (abundant in the neighbourhood of Dire Dawa), but the latter could never be confused with its much smaller glossy spotted leaves and squat flowers only 20 mm. long.

Description: *Plants* acaulescent or with short stem, growing singly or sometimes dividing into 2—4 rosettes that are up to 60 cm. diam.

Leaves about 24, densely rosulate, lanceolate-attenuate, spreading to a little recurved, 50 cm. long, 12—15 cm. broad at base; *upper surface* pale to dark olive-green, sometimes a little glossy, without spots or markings except when young, flat low down, slightly canaliculate upwards; *lower surface* convex, similar to upper surface but sometimes with a few dull obscure elongated pale-green blotches near base; *margins* sinuate-dentate, mostly with horny reddish-brown edge armed with teeth the same colour, that are deltoid, pungent, 3—4 mm. long, 10—15 mm. distant; *sap* dries deep brown.

Inflorescence a branched panicle about 70—90 cm. high.

Peduncle flattened and 20—25 mm. broad at base, 6—8-branched from the middle or lower, marked below the first branch with many elongated very narrow pale-green lines that are broken at intervals.

Racemes cylindric-acuminate, the terminal 20 cm. long, laterals a little shorter, the buds suberect, crowded and hidden by densely imbricate bracts, older buds spreading, open flowers laxer, subpendulous.

Bracts broadly ovate-acute, 10 mm. long, 7 mm. broad, thin, scarious, brownish, 5-nerved.

Pedicels lowest 15 mm.

Perianth deep red, 33 mm. long, cylindric-trigonous, rather thick and fleshy, basally obconic, shortly stipitate, 11 mm. diam. across the ovary, thence trigonous upwards; *outer segments* free for 10 mm., obscurely 3-nerved, apices subacute, slightly spreading; *inner segments* broader than the outer and with more obtuse more spreading apices.

Filaments pale lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 3—4 mm.

Stigma at length exserted 5 mm.

Ovary pale brown, 7 mm. long, 3·5 mm. diam.

A. pubescens Reynolds. Species nova, affinis *A. trichosanthae* Berger, foliis angustioribus, racemis brevioribus, pedicellis longioribus, perianthio longiore minute pubescente differt.

Planta acaulis, interdum caulibus 20—30 cm. longis. *Folia c.* 16, rosulata, anguste lanceolato-attenuata, suberecta, usque ad 45 cm. longa, 8 cm. lata; *supra* viridia, immaculata, basi planiuscula, superne concava; *subtus* convexa; ad margines dentata, dentibus deltoideis brunneis 2—3 mm. longis, 15—20 mm. distantibus armata. *Inflorescentia* simplex vel interdum 1—2-ramosa, 70 cm.—1 met. alta. *Racemus* cylindrico-acuminatus *c.* 15 cm. longus, alabastris suberectis bracteis magnis obtectis. *Bracteae* deltoideo-ovatae, 20 mm. longae, 6 mm. latae, scariosae, albidae, 7—9-nervatae. *Pedicelli* 15 mm. longi. *Perianthium* roseum, cylindrico-trigonum, 42 mm. longum, circa ovarium 8 mm.

PLATE X. *Aloe pubescens* Reynolds.

Plant × 1/8 approx., 16 Km. (10 miles) north-east of Shashamanna (234 Km. south of Addis Ababa), Arussi Province, Ethiopia.

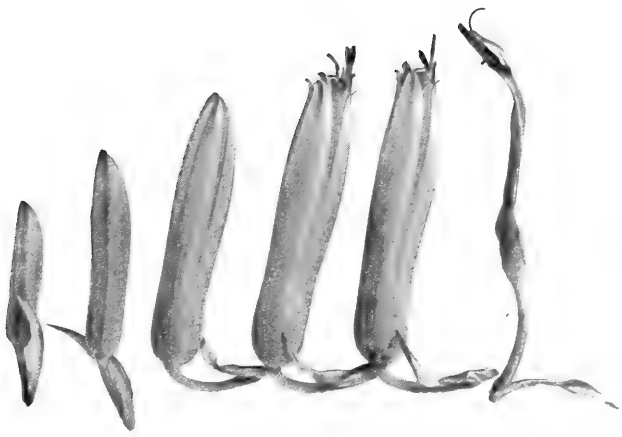

PLATE XI. *Aloe pubescens* Reynolds.
Flowers 1/1, from bud to post-pollination stage.

diametro; *segmenta exteriora* per 16 mm. libera, 3-nervata. *Antherae* 3—4 mm. exsertae. *Stigma* demum 5 mm. exserta. *Ovarium* 7 mm. longum, 3 mm. diametro. (Plates X, XI.)

Ethiopia. Arussi Province, on rocky banks of a stream 16 km. N.E. of Shashemenne (Shashamanna), 234 km. south of Addis Ababa, *c.* 7° 16′ N., 38° 38′ E., *c.* 1,800 met., 3 May 1956, Reynolds 8144 holotype (PRE).

This distinctive new species was found in the Arussi Province at a point 234 km. (152 miles) south of Addis Ababa, 164 km. (102 miles) south of Modjo, and 16 km. (10 miles) north of Shashemenne (also spelt Shashamanna) on the road to Yrgalem and Neghelli in the far south. Many plants were growing on rocky banks of a stream at 1,800 met. (6,000 ft.) and were mostly in groups, with little or no stems, although sometimes stems reach 20—30 cm.

A. pubescens is characterized by having cylindric-acuminate racemes about 15 cm. long, the youngest buds hidden by large densely imbricate bracts, 15 mm. pedicels, and strawberry-pink, 42 mm. cylindric-trigonous flowers which are pubescent. The pubescence indicates an affinity with *A. trichosantha* Berger (which occurs further north near Modjo) but the latter has longer (30 cm.) narrower racemes, much shorter (5 mm.) pedicels, smaller flowers that are strikingly albo-tomentose, and different leaves.

Description: *Plants* singly or in groups, acaulescent or with stems branching from base, and up to 20—30 cm. long.

Leaves about 16, rosulate, lanceolate-attenuate, suberectly spreading, averaging 45 cm. long, 8 cm. broad at base; *upper surface* grey-green, without spots or markings except when young, flat low down, slightly concave upwards; *lower surface* convex, similar to upper surface; *margins* armed with deltoid pungent teeth that are white at base, reddish-brown in upper half, 2—3 mm. long, smaller and more crowded low down, 15—20 mm. distant in upper half of leaf.

Inflorescence simple or 1—2 branched, 70—100 cm. tall.

Peduncle plano-convex and 15 mm. broad at base, terete and somewhat sulcate upwards.

Racemes cylindric-acuminate, about 15 cm. long, the apical buds covered by large densely imbricate bracts, older buds grey-green tipped, spreading, open flowers subpendulous.

Bracts ovate-deltoid, 20 mm. long, 6 mm. broad, white, thin, scarious, 7—9-nerved.

Pedicels 15 mm. long, the pink colour of the perianth.

Perianth coral-pink, cylindric-trigonous, 42 mm. long, 8 mm. diam. across the ovary, slightly narrowed above the ovary, thence enlarging

a little and narrowing to the mouth, the whole perianth shortly pubescent; *outer segments* free for 16 mm., 3-nerved, with white border and subacute slightly spreading apices; *inner segments* broader than the outer, with 3 crowded nerves forming a pink keel, the apices more obtuse and more spreading than the outer.

Filaments lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 3—4 mm.

Stigma at length exserted 5 mm.

Ovary pale brown, 7 mm. long, 3 mm. diam.

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ADDITIONAL NOTE ON *ADENOGRAMMA*

By R. S. Adamson

The description by Thunberg (Prod. Pl. Cap. 53, 1794) of *Pharnaceum teretifolium* has for long remained uncertain in its connotation. The original diagnosis was very short, and though somewhat amplified later, Fl. Cap. ed. Schult. 274, 1823, the species has been a doubtful one since. The majority of writers since Thunberg have repeated his diagnosis with little or no alteration, but sometimes with explanatory notes that were not always correct (e.g. Willd. Sp. Pl. 1, 1508, 1798; Pers. Syn. 1, 330, 1805; Roem. & Schult. Syst. 6, 686, 1820; Spreng. Syst. 1, 989, 1825; DC. Prodr. 3, 363, 1828; etc.) Fenzi (Ann. Wien. Mus. 2, 260, 1840) in his monograph treated it as a doubtful species. Though he had evidently not seen a specimen, he suggested that it is allied to *P. incanum* and *P. reflexum* and that the statements about the length of the leaves and inflorescences might have been unintentional errors by Thunberg. Sonder (Fl. Cap. 1, 144, 1860) merely translates Thunberg's description but adds a note that the plant probably belongs to *Adenogramma* and is allied to *A. rigida* Bartl.

Recently through the courtesy of the Director of the Naturhistorigka Riksmuseum, Stockholm, a number of sheets have been loaned to me for examination. These include several collected and named by Thunberg himself. Examination of these specimens has shown clearly that the plant is a species of *Adenogramma* and is identical with that recently described as *A. Asparagoides* Adamson J. S. Af. Bot. 21, 88, 1955. This last name thus becomes a superfluous synonym.

In the Linnean herbarium there is a sheet (387.11) of this same plant which is unnamed and merely inscribed "Cap".

The species would appear to be a rare one. At any rate it does not seem to have been collected between the time of its original discovery by Thunberg and its rediscovery a few years ago by Esterhuysen. It was on the latter collections that the supposed new species was founded.

On the transfer of the species to *Adenogramma* a new combination is necessary and the species becomes:—

Adenogramma teretifolia (Thunb.) Adamson comb. nov.

Pharnaceum teretifolium Thunb. Prod. Pl. Cap. 53, 1794.

Mollugo teretifolia Ser. in DC. Prodr. 1, 393, 1824.

Ginginsia teretifolia DC. Prodr. 3, 363, 1828.

A. asparagoides Adamson J. S. Af. Bot., 21, 88, 1955.

A NEW SPECIES OF ALOE FROM MOZAMBIQUE

By G. W. Reynolds

(With Plates XII, XIII.)

Aloe decurva Reynolds. Species nova, affinis *A. orthlophae* Christian et Milne-Redhead, pedunculo curvo racemis deflexis cylindraceis floribus densioribus subsessilis differt.

Planta succulenta, acaulis. *Folia* 20—24, dense rosulata, ensiformia, patentia, canaliculata, recurva, basi 9 cm. lata, 15—20 mm. crassa, usque ad 55 cm. longa, supra viridula, immaculata, subtus convexa, ad margines sinuato-dentata, dentibus 3 mm. longis, 8—15 mm. distantibus munita.

Inflorescentia saepe simplex, 90 cm. alta. *Pedunculus* curvatus. *Racemi* densissimi, late cylindracei, 15—20 cm. longi, 10—12 cm. diametro, deflexi vel decurvi. *Bracteae* ovato-acutae, 2 mm. longae, 3 mm. latae, 3-nervatae. *Pedicelli* usque ad 1 mm. longi. *Perianthium* rubrum, cylindraceo-ventricosum, trigonum, 38 mm. longum; *segmenta exteriora* fere libera. *Antherae* 10—12 mm. exsertae. *Stigma* demum 15—20 mm. exserta. *Ovarium* 6 mm. longum, 3·5 mm. diametro. (Plates XII, XIII.)

Mozambique: Along the top of Zembe Mountain, 18 miles south of Vila Pery, 3,500 ft., cult. hort. Munch, Rusape, fl. 15 July 1956, Reynolds 8200 holotype (PRE), isotype (SRGH, K).

This very distinctive new species was discovered in 1949 by Mr. R. C. Munch of "Mona", Rusape, Southern Rhodesia, on Zembe Mountain, 18 miles south of Vila Pery (on the Umtali—Beira road) and about 93 miles by road east of Umtali.

Plants collected there flowered regularly in Mr. Munch's gardens, but a plant grown in Johannesburg for five years has not flowered.

In July 1956, Mr. and Mrs. Munch conducted me to Zembe Mountain, and after a steep climb of a thousand feet we found large numbers of plants growing in shallow pockets of soil on semi-denuded granite slopes along the top of Zembe Mountain (with *A. excelsa* Berger, *A. Chabaudii* Schonl. and *A. Cameronii* Hemsl. nearby), but only two plants were found with a few flowers left.

A. decurva is distinguished from all other known species by having a somewhat sulcate curved peduncle bearing a short densely flowered "bottle-brush"-like raceme that is always deflexed or decurved. The bracts and the almost sessile flowers are also deflexed.

The 38 mm. cylindric-ventricose flowers of *A. decurva* appear to be nearest allied to those of *A. orthologha* Christian et Milne-Redhead from Mtoroshonga Pass in the Umvukwes, 61 miles north of Salisbury, but the latter has a 2—4-branched inflorescence, much longer horizontal racemes, 8 mm. pedicels, secund flowers, and very different leaves.

In leaf characters only, *A. decurva* is near *A. sessiliflora* Pole Evans, which differs in having much longer narrower "bottle-brush"-like racemes of sessile considerably shorter campanulate flowers.

Only two plants were found on Zembe Mountain with forked peduncles, all the others being simple. Two and three inflorescences are produced from a rosette, and flowers open first along the sunny side of racemes.

The description is based on observations on Zembe Mountain and on several specimens from the same locality flowering in Mr. Munch's gardens.

Description: *Plants* acaulescent or with very short stem, solitary, sometimes dividing into 2 rosettes.

Leaves 20—24, densely rosulate, ensiform, spreading and recurved near apex, up to 9 cm. broad at base, 15—20 mm. thick, gradually attenuate and up to 55 cm. long; *upper surface* dull green with reddish tinge, without spots or markings, concave at base, canaliculate upwards; *lower surface* rounded, dull green, without spots or markings; *margins* sinuate-dentate, armed with pungent deltoid teeth averaging 3 mm. long, irregularly 8—15 mm. distant; *sap* dries yellow.

Inflorescence simple, very rarely furcate, up to 90 cm. long, sometimes 2—3 from a rosette.

Peduncle curved obliquely, with the raceme decurved, basally plano-convex and 20 mm. broad, brown and somewhat sulcate, with several sterile-bracts, the lowest broadly ovate-acute, 20 mm. long, 15 mm. broad at base, thin, scarious, many-nerved, smaller upwards.

Racemes very densely flowered, broadly cylindric, very slightly acuminate, 15—20 cm. long, 10—12 cm. diam., youngest buds minutely spotted and spreading slightly downwards, the whole raceme curved downwards, the flowers deflexed and opening first on the sunny side.

Bracts very small, broadly ovate-obtuse, 2 mm. long, 3 mm. broad at base, thin, subscarious, 3-nerved.

Pedicels negligible, at most 1 mm. long.

Perianth bright red, sometimes orange, cylindric-ventricose, trigonal, averaging 38 mm. long, 5 mm. diam. across the ovary, 11 mm. at the middle, thence narrowing to a constricted mouth with the segment apices pressing on the exserted filaments; *outer segments* free almost to base (tube 5 mm. at most), 5-nerved, the apices subacute, straight; *inner segments* broader than the outer, thinner at the edges, the apices more obtuse.

PLATE XII. *Aloe decurva* Reynolds.

Plants × 1/10 approx., on top of Zembe Mountain, 18 miles south of Vila Pery, Mozambique; 3,500 ft.
Flowers mostly over on 20 July 1956.

FIG. 1.

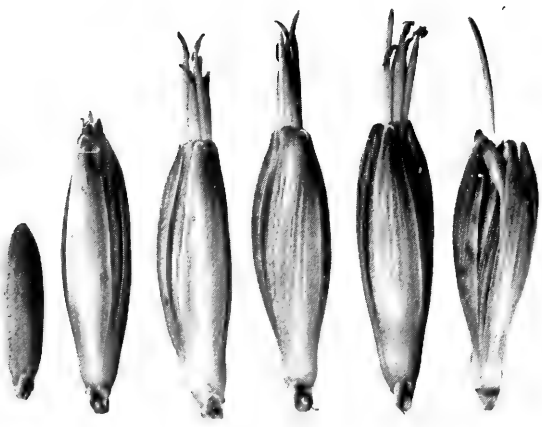

FIG. 2.

PLATE XIII. *Aloe decurva* Reynolds.

FIG. 1. Raceme × 1/6 approx., at the angle produced.
FIG. 2. Flowers 1/1, from bud to post-pollination stage.

Filaments filiform-flattened, rather thick, pink within, the exserted portion orange, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 10—12 mm.

Stigma at length exserted 15—20 mm.

Ovary pale green, 6 mm. long, 3·5 mm. diam.

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Mr. and Mrs. R. C. Munch for conducting me to Zembe Mountain, and for much other assistance.

Dr. R. A. Dyer, Chief, Division of Botany, Pretoria, for photographs from my negatives, and for the facilities of the National Herbarium, Pretoria.

BYDRAE TOT DIE KENNIS VAN MICROPTERUM SCHWANT.—SUBGENUS AETHEPHYLLUM (N.E.Br.) SCHWANT.*

Deur D. G. Winkler.

(Botaniese Assistente, Compton-herbarium, Kirstenbosch)

Micropterum Schwant. is een van die mesofitiese genera van die Aizoaceae. Dit is 'n klein genus wat volgens Schwantes (1950) ag soorte insluit. Schwantes het die genus in twee subgenera opgedeel, nl. *Eu-Micropterum* Schwant. en *Aethephyllum* (N.E. Br.) Schwant. L.g. bevat twee species, nl. *Micropterum pinnatifidum* (L.f.) Schwant. en *Micropterum herrei* Schwant. Albei is eenjarige kruidgewasse wat veral teen berghange in die winterreënstreek van Kaapland voorkom. Hulle is opvallend weens hulle veerspletige blare wat met glinsterende papillae beset is, terwyl die blomme onopsigtelik is. Die hoofas is kort en dra neerliggende, dichasiaal-vertakte syspruite. Die plante bereik 'n deursnee van 60 cm.

Werkmetodes: Sagte dele soos blomknoppe is in paraffienwas ingebed en met die mikrotoom 10 tot 15 mikron dik gesny. Tersier-butielalkohol as dehidreermiddel en Delafield se haematoxylin as verfstof het die beste resultate gelewer. Stukverf van blomknoppe met 'n alkoholiese oplossing van boraks-karmyn het waardeloos geblyk, aangesien l.g. alleen 'n kern-verfstof is. Die studie van die blomontogenie en die vrugontwikkeling is gedeeltelik met behulp van 'n stereoskopiese ontleedmikroskoop gedoen.

DIE MORFOLOGIE EN ONTOGENIE VAN DIE BLOM

Die Volwasse Blom

M. pinnatifidum.—(Fig. 1A.)

Die oop blom is tot 1 cm. in deursnee. Die omgekeerd keëlvormige receptaculum dra net soos die kelkblare en blomsteel groot epidermale papillae.

Die vyf kelkblare is op die rand van 'n kort receptaculumbeker ingeplant. Die buitenste twee is ongeveer ewegroot, spatelvormig en 3—8 cm. lank. Die orige drie is rofweg driehoekig, kleiner as die buitenstes en van perkamentagtige rande voorsien.

Daar is ongeveer 20 geel, spreidende kroonblare in twee tot drie kranse. Hulle is 1 mm. breed en korter as die buitenste, maar langer as

*Uittreksel uit 'n verhandeling ingelewer ter verkryging van die M.Sc. graad in die Plantkunde aan die Universiteit van Stellenbosch, November 1955.

die binneste kelkblare. Die punte van die binneste kroonblare is dikwels effens gekeep. Daar is geen staminodia nie, hoewel die basisse van sommige van die binneste kroonblare behaard is soos die van die meeldrade.

Daar is meestal vyf meeldrade. Vroeg in die blomseisoen wissel die aantal tussen 5 en 14, maar later in die jaar is dit 5 by 80% van die blomme, en gewoonlik nie meer as 7 nie. Daar is nooit minder as vyf meeldraadprimordia in die jong blomknop gevind nie, maar deur aborsie kan een of meer van hulle gedurende die verdere ontwikkeling verdwyn, sodat by sommige blomme die meeldrade heeltemal ontbreek, terwyl

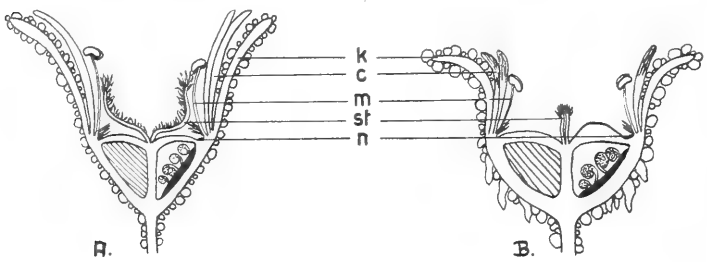

FIG. 1: Lengtedeursnee deur die blom van: A. *M. pinnatifidum*; B. *M. herrei*. (4 × vergroot.)
c, kroon; k, kelk; m, meeldraad; n, nektarklier; st, stempel.

die vrugbeginsel normaal ontwikkel is. Moontlik verklaar dit die feit dat Schwantes (1950) net by een van die blomme tot sy beskikking vyf meeldrade gevind het. Die helmdrade is ongeveer 2 mm. lank, aan die basis behaard, en soos die kroonblare aan die binnevlak van die receptaculumbeker vasgeheg. Die helmknoppe is klein en beweeglik.

Binnekant die meeldraadkrans en teenoor die vrugblare kom die vyf onopvallende, liggroen nektarkliere voor. Hulle is tangensiaal verleng en reik byna teen mekaar.

Daar is vyf, in sommige gevalle vier of ses, vrughokke. Die boonste oppervlakte van die vrugbeginsel is effens konveks en sonder radiale riwwe. Die stempels is ongeveer 3 mm. lank, spreidend, lynvormig en aan die binnevlak met verlengde papillae bedek.

M. herrei.—(Fig. 1B.)

Die blom is ongeveer 1 cm. in deursnee. Blomsteel, receptaculum en kelkblare is ook hier met papillae bedek. Die papillae van die bekervormige receptaculum is besonder groot en dikwels verleng.

Die vyf kelkblare is almal rofweg driehoekig. Die buitenste twee is ongeveer 5 mm. lank, die binneste drie korter, met perkamentagtige rande. Die kelk is ingeplant soos by *M. pinnatifidum*.

Die kroonblare is wit met persrosa punte wat dikwels effens getand is. Daar is ongeveer 20, in twee tot drie kranse. Hulle is korter as die kelkblare, 2—4 mm. lank. Binnekant die kroonblare is daar 6—10 lynvormige staminodia wat soms aan die basis behaard is soos die meeldrade.

Die aantal meeldrade varieer tussen 11 en 19. Die helmdrade is 2 mm. lank. Verder lyk die meeldrade soos by *M. pinnatifidum.*

Die vyf donkergroen nektarkliere is net effens verleng en die afstand tussen hulle is groter as by *M. pinnatifidum.*

Daar is vyf, of soms ses, vrughokke. Die boonste oppervlakte van die vrugbeginsel is effens konveks en dra vyf prominente radiale riwwe. Die stempels is 1 mm. lank en, in teenstelling met dié van *M. pinnatifidum*, regop.

Die Ontogenie van die Blom

(Fige. 2, 3 en 4)

Aangesien die blomontwikkeling by die twee species grootliks ooreenstem, word hier 'n algemene beskrywing gegee wat op albei van toepassing is tensy anders vermeld word.

Die kelk. Die kelkblare word in 'n 2/5 spiraal gevorm wat regs- of linksom mag wees.

Met die begin van die reproduktiewe fase word bo-aan die hoofas 'n blomknop gevorm wat lengtegroei tot stilstand bring. Die kelkspiraal van hierdie eindknop is 'n voortsetting van die loofblaarspiraal (ook 'n 2/5 spiraal) en kan soos l.g. regs- of linksom wees. Die orige blomme word op dichasia gedra wat uit die oksels van die loofblare spruit, en by die kelk van hierdie blomme kon geen konstantheid t.o.v. sy rigting vasgestel word nie.

Aan die een kant van die koepelvormige vegetasiepunt ontstaan 'n klein bultjie, die primordium van die eerste kelkblaar. Kort daarna word ongeveer teenoor hierdie heuweltjie die tweede, en dan agtereenvolgens die derde, vierde en vyfde kelkblaar aangelê, op so 'n wyse dat hulle in 'n duidelike spiraal gerangskik is. Terwyl die laaste kelkblaar aangelê word, toon die eerste twee reeds tekens van differensiasie, d.w.s. hulle word effens plat en ontwikkel papillae.

Die androecium. Die meeldraadprimordia ontstaan wanneer die vegetasiepunt meer of minder volledig deur die binneste kelkblare bedek word. Binnekant die kelkblare word hulle dan as klein bultjies sigbaar. Daar is altyd vereers net vyf van hulle, afwisselend met die kelkblare, en hulle ontstaan blykbaar gelyktydig.

Die blom van *M. herrei* bevat 11 tot 19 meeldrade. Die eerste vyf

anlages ontstaan soos beskryf. Aan weerskante van elk van drie of meer van hierdie jong meeldrade ontstaan nou weer twee meeldraadprimordia, effens laer op die groeipunt en net buitekant die eerste meeldraadkrans. Op hierdie stadium het die punte van die eerste meeldrade reeds knopvormig opgeswel. Direk buitekant een of meer van die eersgevormde meeldrade kan nou nog een meeldraad elk aangelê word wat dan in dieselfde krans lê as dié wat weerskante van die eerste meeldrade gevorm is. Gewoonlik bly die vorming van meeldrade by albei species beperk tot die sektore wat met die vrugblare afwissel. By *M. herrei* kan soms nog enkele meeldrade in die sektore regoor die vrugblare ontstaan, maar nooit meer as een in elke sektor nie.

By *M. pinnatifidum* ontwikkel die eerste vyf meeldrade ook direk uit die primordia. Wanneer meer as vyf meeldrade aangelê word, ontstaan die origes op dieselfde wyse as by *M. herrei*.

By die species wat deur hom ondersoek is, het Hagen (1873) gevind dat die anlages van die meeldraadkrans in die vorm van vyf heuweltjies is, op die punte waarvan die meeldrade self dan as klein swellings aangelê word. Dieselfde is deur Leistner (1954) by *Skiatophytum* vasgestel. By *M. pinnatifidum* en *M. herrei* is geen soortgelyke verskynsel waargeneem nie; elk van die bultjies ontwikkel direk tot een meeldraad.

Sodra die meeldrade aangelê is, begin hulle punte tot helmknoppe ontwikkel wat reeds vroeg hul maksimale grootte bereik. Die helmdraad is massief en bly kort totdat die blomknop klaar gedifferensieer is, waarna dit dan vinnig verleng. Die helmdrade van die buitenste krans word langer as dié van die binneste, en die twee kranse kan dus nog in die oop blom onderskei word. Voordat die blom oopgaan, is die meeldrade oor die vrugbeginsel gebuig. Aan die basis van die byna volwasse meeldraad ontwikkel lang, haarvormige papillae.

By *M. herrei* is daar, in teenstelling met *M. pinnatifidum*, verskeie staminodia aanwesig. Hulle is kroonblaaragtig en tot op 'n laat stadium nie van die kroonblare te onderskei nie.

Die kroon. Na die meeldraad- en vrugblaarprimordia word die kroonblare aangelê, die eerstes in die sektore wat met die vrugblare afwissel. Daarna gaan die inisiasie van kroonblare oor tot die hele omtrek van die groeipunt. Die kroonblare is in twee tot drie kranse gerangskik en kan reeds vroeg in die ontwikkeling herken word omdat hulle gou afgeplat word. In blomme waar daar net vyf meeldrade is, word 'n paar van die kroonblare presies op die plekke gevorm wat by blomme met meer as vyf meeldrade deur die orige meeldrade ingeneem sou word; 'n aanduiding daarvan dat die kroonblare gewysigde meeldrade is.

Die gynoecium. Tot op hierdie stadium het die groeipunt sy koepelvorm behou. Eers wanneer die vrugblare aangelê word, verloor dit hierdie

vorm en word afgeplat. Die aantal vrugblare is meestal vyf, in enkele gevalle ses, of by *M. pinnatifidum* ook soms vier.

Die vrugblaaranlages ontstaan net na die meeldraadprimordia, afwisselend met hulle en hoër op teen die groeipunt. Hulle word as klein bultjies sigbaar wat vinnig verleng. Deurdat hulle tot 'n mate ook tangensiaal groei, vertoon hulle soos effens na binne gebuigde riffies (v in Fig. 2, i). Die sentrale deel van die vegetasiepunt wat ons in die vervolg die as gaan noem, verleng ook, maar tegelykertyd word die groei aan die binnekant van elke vrugblaar gestrem. Die gevolg is dat daar op die groeipunt vyf holtes ontstaan, een binnekant elke vrugblaar.

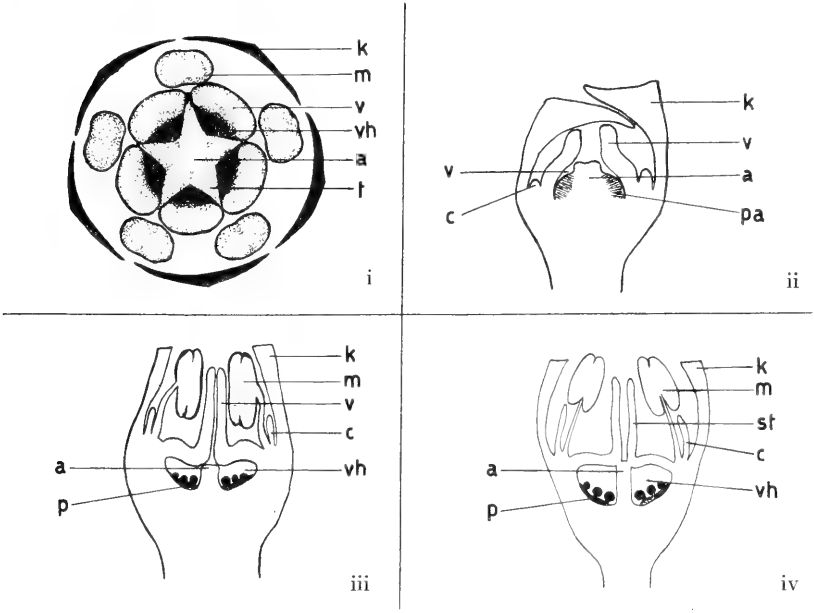

Fig. 2. Stadia in die blomontwikkeling van *M. pinnatifidum*:

i. Blomknop met eerste meeldrade en jong vrugbeginsel, van bo; kelkblare skematies aangedui.

ii. Lengtedeursnee deur blomknop, op effense later stadium as 1. Meeldrade is nie aangedui nie.

iii. Soos 2, op later stadium. Aanhegtingspunte van vrugblare verhef, placenta reeds byna wandstandig.

iv. Soos 2, byna volwasse blomknop; placenta wandstandig, vrugbeginsel volledig onderstandig.

a, as; c, kroon; k, kelk; m, meeldraad; p, placenta; pa, placenta-anlage; st, stempel; t, tussenskot; v, vrugblaar; vh, vrughok.

Die holtes is die anlages van die vrughokke (vh), en hulle word vinnig dieper namate die as en die vrugblare verleng.

Die as (a) is in die middel van die blomknop as 'n vyfstralige, stervormige struktuur te sien. Die strale van hierdie ster vorm die anlages van die vyf tussenskotte (t) terwyl die jong vrughokke deur die inkepings tussen die strale voorgestel word. Die wand van die jong vrugbeginsel bestaan dus tot op hierdie stadium uit die afgeplatte vrugblare waarvan die toppe intussen vingervormig verleng. Tussen hulle en vergroeid met hulle lê die buitenste rande van die tussenskotte.

'n Ringvormige interkalêre groei vind nou plaas in die receptaculum onder die vrugblare, waardeur hul aanhegtingspunte na bo opgestoot word soos op 'n ringwal (Fige. 3 en 4). Dit beteken dat die buitewande van die vrughokke nou grotendeels uit weefsel van die receptaculum bestaan, en wanneer die selle in hierdie streek later verleng, word die vrugblare verder na bo verplaas. Dus word die buitewande van die vrughokke dan alleen deur weefsel van die receptaculum voorgestel, en die vrugblare in die volwasse blom het nie meer 'n deel in die vorming van die vrugbeginsel se buitewand nie.

Tot op 'n sekere stadium hou die as en tussenskotte tred met die lengtegroei in die orige dele van die vrugbeginsel. Daarna lyk dit asof seldeling in die asgedeeltes tot stilstand kom, hoewel selstrekking later nog verdere toename in lengte veroorsaak. Die vrugblare verleng verder en groei terselfdertyd sentripetaal om die vrughokke van bo te bedek. Die blomknop is op hierdie stadium ongeveer 1 mm. lank. Die distale dele van die vrugblare is vingervormig, maar hulle basisse het intussen breër geword. Soos die vrugblare nou na die middel toe groei, versmelt hulle rande met die tussenskotte en tegelyk ook lateraal met mekaar. Omdat die vashegtingstreek van die vrugblare intussen verhef is, moet die rande van die vrugblare afbuig om van bo met die tussenskotte te versmelt en sodoende die vrughokke te voltooi.

Wanneer die vrugblare volledig met mekaar versmelt het, is die posisie van die tussenskotte van bo net as vyf groefies te sien en die vrugblare self word deur vyf radiaalgestrekte heuweltjies gekenmerk.

Waar die vrugblare in die middel die boonste vlak van die as raak, verleng hulle verder na bo om die stempels te vorm (Fig. 4). Die blomknop is nou ongeveer 2 mm. lank. Die stempels verleng vinnig en ontwikkel papillae aan hul binnevlak.

Die bulte op die vrugbeginsel wat tot nou toe die vrughokke gekenmerk het, verdwyn nou omdat 'n vinnige breedtetoename in die blomknop plaasvind. In 'n blomknop van ongeveer 4 mm. lengte is die boonste vlak van die vrugbeginsel reeds byna plat. By *M. pinnatifidum* is dit

gelyk, terwyl by *M. herrei* die rande van die toekomstige vrugkleppe na buite omgebuig is om vyf prominente radiale riwwe te vorm.

Dis vanselfsprekend dat alle dele van die blomknop vergroot namate die ontwikkeling vorder; die as, tussenskotte en receptaculum strek en die vrughokke word dieper.

Soos uit bostaande blyk, het die vrugblare as sulks geen aandeel by die vorming van die laterale vrugwand, as en tussenskotte nie. Hierdie dele word direk uit die topmeristeem van die groeipunt gedifferensieer. In die talryke blomknoppe wat ondersoek is, het altyd geblyk dat die stervormige aksiale struktuur wat tydens die aanlê van die vrughokke uit die vegetasiepunt ontstaan, direk aan die as en tussenskotte oorsprong gee. Die laterale buitewande van die vrughokke bestaan in die volwasse blom uit receptaculumweefsel.

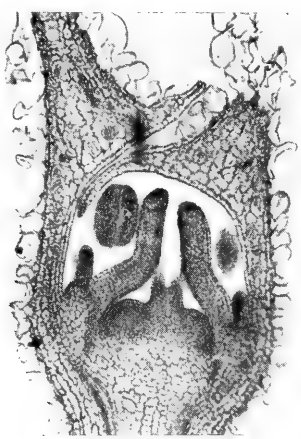

FIG. 3. Mikrofoto van lengtedeursnee deur 'n jong blomknop van *M. pinnatifidum*. Placenta-anlage in die middel teenaan die as. (ca. 76 × vergroot.)

In elke vrughok ontstaan 'n placenta-anlage wat reeds vroeg teenaan die basale deel van die sentrale as soos 'n kussingvormige weefsel met klein, protoplasmaryke selle sigbaar is (Fig. 3). Die placenta word reeds aangelê wanneer die vrughokke nog nie volledig deur die vrugblare bedek word nie. Die placenta in die volwasse blom is egter wandstandig. Daar kan met 'n redelike mate van sekerheid beweer word dat die verskuiwing van die placenta uit sy aksiale na sy pariëtale posisie soos volg geskied: kort nadat die placenta-anlage onder teenaan die as sigbaar word, vind in die basale dele van die as seldelings plaas wat 'n breedtegroei daarvan

veroorsaak, terwyl die boonste dele van die as nog besig is om te verleng. Hierdeur, en ook deurdat die receptaculum self breër word, word die placenta van sy asstandige na 'n basale posisie verskuif. Die verdere verplasing hiervandaan na die pariëtale posisie word hoofsaaklik of geheel-en-al deur selvergroting teweeggebring. Deur hierdie strekking word die selle van die receptaculum so gerangskik dat hulle in min of meer reelmatige rye lê (Fig. 4). Al die weefsel onderkant die vashegtingspunte van die vrugblare word beskou as behorende tot die receptaculum.

FIG. 4. Soos Fig. 3, op 'n later stadium. Placenta ongeveer wandstandig, vrugblare na bo verplaas. (ca. 60 × vergroot.)

Daar is op geen stadium in die ontwikkeling 'n aanduiding dat die placenta direk op die vrugblare gedra word nie.

Die primordia van die saadknoppe verskyn as klein knopvormige swelsels op die nog gedeeltelik asstandige placenta. Hulle ontstaan basipetaal, d.w.s. die eerstes word bo aan die placenta gevorm.

Teen die tyd wanneer die placenta heeltemaal wandstandig is, is elke saadknop van twee integumente voorsien en begin die funiculi te verleng. Hier is dan die oudste saadknoppe onderaan die placenta en

die jongstes bo, hoewel die verskil in ouderdom nie baie duidelik is nie. By die volwasse blom kom daar op die placenta tussen die funiculi digte kussings van verlengde, klieragtige selle voor. Volgens Huber (1924) dien hierdie selle ter voeding van die stuifmeelbuise.

Die onderstandige vrugbeginsel. Die vrugblaarprimordia ontstaan hoër op teen die groeipunt as die meeldrade en kroonblare. Maar die vrugbeginsel in die volwasse blom is onderstandig. Die volgende groeiverskynsels in die ontwikkelende blomknop is hiervoor verantwoordelik: Soos reeds verduidelik, begin die receptaculum onderkant die vashegtingstreek van die vrugblare op 'n vroeë stadium deur seldeling te verleng. Lengtegroei deur meristematiese aktiwiteit vind ook in ander dele van die torus plaas. (Onder torus verstaan ons hier die kringvormige strook van die receptaculum wat die verskillende blomblaarkranse dra.) Deur hierdie groei wat blykbaar net vir 'n tydjie aanhou, word nou ook die aanhegtingstreek van die meeldrade en kroonblare verhef. Hierna is geen verdere seldelings in bepaalde stroke van die receptaculum waargeneem nie. Van nou af vind blykbaar hoofsaaklik net selvergroting plaas, en die vrugbeginsel word volledig onderstandig deurdat die selle van die torus verleng. In die deel van die torus wat die kelkblare dra, is na die aanlê van die kelkblare op geen stadium 'n opvallende meristematiese aktiwiteit waargeneem nie. Dit lyk dus asof die kelkblare hulle uiteindelike posisie bokant die vrugbeginsel hoofsaaklik aan selstrekking te danke het.

In die volwasse blom vorm die torus 'n kort riffie, die receptaculumbeker, rondom die vrugbeginsel. Op die rand van hierdie riffie is die kelkblare ingeplant terwyl die meeldrade en kroonblare aan die binnevlak daarvan gedra word, met die aanhegtingspunte van die kroonblare effens bokant dié van die meeldrade (Fig. 1).

Bespreking

Uit die bevindings van Huber (1924) en Leistner (1954) blyk dat, by die species wat deur hulle ondersoek is, die placenta in die jong blomknop aangelê word op die rande van die vrugblare wat by die as vergroei het. By *M. pinnatifidum* en *M. herrei* groei alleen die distale dele van die vrugblare na die middel om die as te ontmoet. Die placenta ontstaan hier ook in 'n asstandige posisie, maar nie op die vrugblaarrande nie. Indien 'n mens in die ontogenie geregverdig is om te onderskei tussen asweefsel en vrugblaarweefsel wat immers uit dieselfde topmeristeem voortspruit, moet dus gesê word dat die placenta by die betrokke twee species op die as self aangelê word, en nie op die vrugblaarrande nie.

Volgens Buxbaum (1948) is die oertipe van die vrugblaar by die

Centrospermae die „Schlauchblatt", of skildvormige (peltatus) vrugblaar. Hierdie tipe vrugblaar is ook by sekere Aizoaceae, b.v. *Trianthema* en *Tetragonia* gevind. Hier spruit die saadknoppe oënskynlik uit die as self, maar ontwikkel in werklikheid op die na binne gevoude rande van die skildvormige vrugblaar. Geen bewyse kon gevind word dat die vrugblaar van *M. pinnatifidum* en *M. herrei* ook die „Schlauchblatt"-tipe verteenwoordig nie.

Vanaf die tyd van De Candolle is verskillende teorieë omtrent die aard van die onderstandige vrugbeginsel opgestel. Hulle is kortliks deur Douglas (1944) saamgevat. Hiervolgens was Schleiden die eerste navorser wat beweer het dat die onderstandige vrugbeginsel hoofsaaklik uit receptaculumweefsel gevorm word, en dat die vrugblare alleen die dak van die vrugbeginsel en die stempels vorm. Die vrugblare is dus net 'n steriele bedekking van die vrugbeginsel. Ons het gesien dat ook by *M. pinnatifidum* en *M. herrei* die vrugblare net die dak van die vrugbeginsel en die stempels blyk te vorm. Die orige dele van die vrugbeginsel ontstaan uit receptaculumweefsel. Hier is dus 'n voorbeeld wat Schleiden se teorie staaf.

Volgens Douglas interpreteer baie navorsers die onderstandige vrugbeginsel as 'n steriele, bekervormige receptaculum wat aan sy binnekant deur die vrugblare uitgevoer word. In so 'n vrugbeginsel moet die vrugblare min of meer hul oorspronklike posisie behou, en alleen die orige dele van die receptaculum bekervormig verleng. Daar by *M. pinnatifidum* en *M. herrei* die receptaculum egter ook onderkant die vrugblare verleng, kan l.g. nie hulle oorspronklike posisie behou nie. Ons moet dus aanneem dat die receptaculum terselfdertyd die vrugwand voorstel, en dat die onderstandige vrugbeginsel by die twee ondersoekte species aksiaal is behalwe vir sy dak. L.g. en die stempels word uit die vrugblare gevorm.

DIE MORFOLOGIE, ONTWIKKELING EN OPENINGSMEGANISME VAN DIE VRUG

Die Volwasse Vrug

M. pinnatifidum.—(Fig. 5).

Soos die meeste Mesembryanthemeae het *M. pinnatifidum* 'n doosvrug wat met vyf kleppe oopgaan. Die droë vrug is 0·5—1 cm. breed en 0·4—0·9 cm. hoog, omgekeerd keëlvormig en skerp vyfhoekig. Die laterale vrugwand is leeragtig en dun sodat die are daarin duidelik uitstaan. Die vrug se boonste vlak is konkaaf en die rande van die vyf vrugkleppe is nie na buite omgebuig nie, maar sluit direk teen mekaar. Wanneer die vrug nat word, sprei die kleppe (KP in Fig. 5) van mekaar. As die vrug deur uitdroging weer sluit, word dit duidelik dat die mediane lyn van elke

klep op 'n tussenskot te lê kom en dat elke klep uit die twee helftes van naburige vrugblare saamgestel is.

Deur die oopsprei van die kleppe word die vrughokke blootgestel. Die 10 tot 20 sade lê los in elke vrughok terwyl die funiculi (NS) op die wandstandige placenta vasgeheg bly. Placentale swelsels ontbreek.

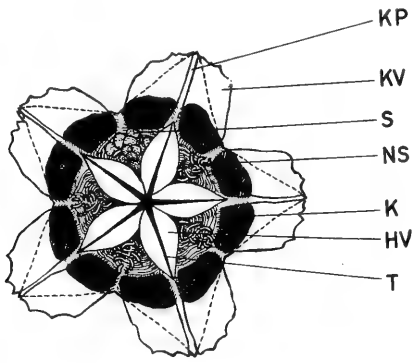

FIG. 5. Oop vrug van *M. pinnatifidum*, van bo. (4 × vergroot.)
HV, hokvlerk; K, kiel; KP, klep; KV, klepvlerk; NS, naelstring; S, saad; T, tussenskot.

Die vrughokke is uitgevoer met 'n gladde, stewige laag wat ons die endokarp gaan noem. Dit bestaan uit een laag selle met verhoute, onreëlmatig gekartelde wande. Die selle is onderling verbind deur stippels.

Die tussenskotte (T) bestaan elk uit 'n paar lae sponsagtige,parenchymatiese selle, met endokarp aan weerskante. Geen duidelike columella kan in die middel van die vrug onderskei word nie. Die boonste rand van elke tussenskot dra twee dun vliese wat na teenoorgestelde kante die twee aangrensende vrughokke gedeeltelik van bo bedek. Hulle is die hokvlerke (HV) en bestaan uit 'n paar lae dunwandige selle. Hulle is goed ontwikkel en sluit 'n groot gedeelte van die vrughokke na bo af.

Die oop- en toegaan van die vrug word teweeggebring deur die kiele (K), twee waarvan aan die binnekant van elke klep gedra word. Hulle is higroskopiese lyste wat opvallend ontwikkel is; hulle neem byna die hele basis van die klep in beslag en is net geskei deur 'n smal, wigvormige ruimte. Die kiel bestaan uit 'n enkele laag dooie selle wat baie verleng is loodreg op die klep, en afgeplat parallel aan die basislyn van die klep. Die selwande is effens verhout en bevat baie stippels. In die droë toestand is die lumen van die kielselle so klein dat dit in 'n dwarsdeursnee net as 'n skrefie vertoon en die enkele selle nouliks onderskei

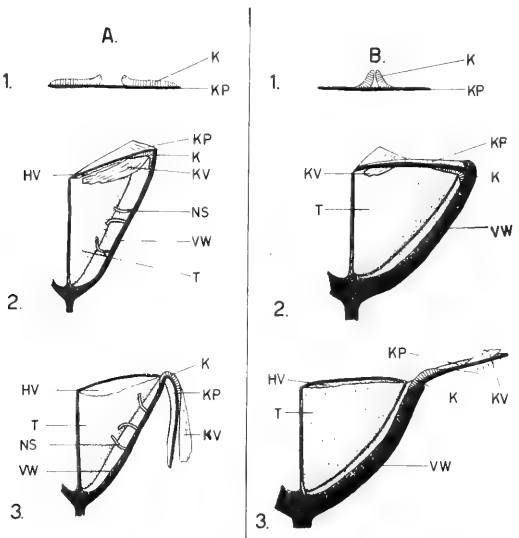

FIG. 6. A. *M. pinnatifidum*; B. *M. herrei*.
1. Dwarsdeursnee deur basis van klep met kiele.
2. Geslote vrug; lengtedeursnee deur 'n vrughok naby die tussenskot.
3. Soos 2, oop vrug. (4 × vergroot.)
HV, hokvlerk; K, kiel; KP, klep; KV, klepvlerk; NS, naelstring; T, tussenskot; VW, vrugwand.

kan word. As die vrug in water geplaas word, neem die selle vinnig water op, waardeur elkeen opvallend in breedte toeneem. In 'n dwarsdeursnee lyk die kielselle nou ruitvormig (soos in Fig. 8), met hul langas parallel aan die basislyn van die klep. Deur die uitset van die kielselle word die kleppe ver na buite omgebuig (Fig. 6, A3). Met uitdroging vind die teenoorgestelde proses plaas en die kleppe buig terug oor die vrughokke (Fig. 6, A2).

Aan sy buiterand dra elke kiel een klepvlerk (KV), 'n groot, perkamentagtige membraan wat aan sy uiteinde onreëlmatig getand is. Dis een sellaag in dikte en die bou van sy selle stem in hoofsaak ooreen met dié van die endokarp.

M. herrei.—(Fig. 7.)

Die ryp doosvrug wat ook met vyf kleppe oopgaan wanneer dit nat word, is gewoonlik groter as by *M. pinnatifidum*, nl. 0·6—1·3 cm. breed en 0·5—0·9 cm. hoog. Dit is afgerond en die laterale vrugwand

is dik, wit en sponsagtig, in teenstelling met die leeragtige vrugwand by *M. pinnatifidum*. Die boonste vlak van die vrug is naasteby plat, maar naby die middelpunt is die rande van die kleppe na buite omgebuig; 'n toestand wat nie by *M. pinnatifidum* aangetref word nie.

Aangesien die kiele (K) swakker ontwikkel is as by *M. pinnatifidum*, gaan die vrug stadiger oop en buig die kleppe nie ver na buite oor nie (Fig. 6, B3). Na sy uiteinde toe is elke klep driepuntig, en dit is die laterale punte daarvan wat in die geslote vrug na buite omgebuig is. Aan die punte van die kleppe is reste van die stempels dikwels nog te onderskei. Die kiele is smaller maar effens hoër as by *M. pinnatifidum* en loop parallel.

Elke klep dra twee klein klepvlerke (KV) wat alleen met hulle binnerande tot teenaan die kiel strek. Histologies stem die kiele en klepvlerke ooreen met dié van *M. pinnatifidum*. Ook die werking van die

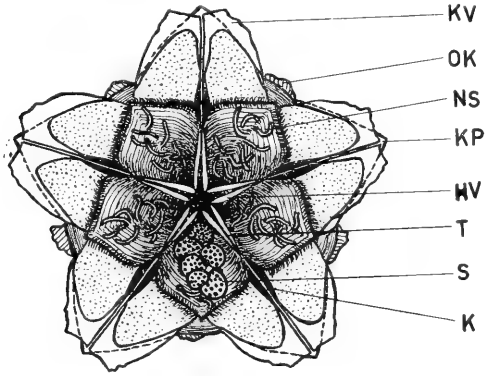

Fig. 7. Oop vrug van *M. herrei*, van bo. (4 × vergroot.)
OK, oorblyfsels van kelk. Ander byskrifte soos by Fig. 5.

kiele, en die bou van die endokarp en tussenskotte is soos by l.g. species. Geen deurlopende columella is in die vrug teenwoordig nie. In teenstelling met *M. pinnatifidum* is die hokvlerke (HV) swak ontwikkel, hulle vorm nou some op die boonste rande van die tussenskotte.

Ook *M. herrei* het wandstandige placentas, sonder swelsels. Elke vrughok bevat gemiddeld 8 sade.

Daar bestaan dus aansienlike verskille tussen *M. pinnatifidum* en *M. herrei* wat betref die bou van die vrug, veral ten opsigte van die kleppe, kiele en hokvlerke; dele waarvan die kenmerke belangrik is by die klassifikasie van die Aizoaceae. Ten spyte van die verskille is hulle in

dieselfde subgenus geplaas, want die twee species toon groot ooreenkomste wat betref die groeivorm en die morfologie van die vegetatiewe dele.

Die Openingsmeganisme van die Vrug

Aangesien alle vrugweefsels dood is, moet dit 'n meganiese proses wees wat die werking van die kiele beheer.

Steinbrinck (1883) het by *Mesembryanthemum linguaeforme* vasgestel dat die kielselle se wande uit twee lae bestaan: 'n buitenste verhoute laag, en 'n binneste dik selluloselaag wat byna die hele selholte vul en deur sy groot uitsettingsvermoë die werking van die kiele veroorsaak.

Garside en Lockyer (1930) het by *Carpanthea pomeridiana* ook 'n dik, gelamelleerde slymlaag waargeneem wat byna die hele selholte vul. Dieselfde is ook by ander Mesembryanthemeae deur Lockyer (1932) gevind.

By *Micropterum herrei* het ons dieselfde toestand: kielselle van 'n oop vrug vertoon in 'n oppervlaktesnee ruitvormig, met baie verdikte wande. Die buitenste laag van die selwand is dun, maar verhout en stewig (v in Fig. 8). Die lumen (l) is as 'n skrefie in die middel van die sel sigbaar. Die hele ruimte tussen lumen en verhoute laag word ingeneem

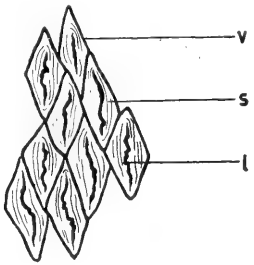

Fig. 8. Oppervlaktesnit deur 'n deel van die kiel van *M. herrei* om die selle te toon wanneer die vrug oop is. (150 × vergroot.)
l, lumen; s, slymlaag; v, verhoute laag van selwand.

deur 'n kleurlose, duidelik gelamelleerde stof (s) wat na behandeling met swawelsuur en jodium (of rutheniumrooi) toon dat dit slym bevat of slymagtig is. Die slym swel op deurdat dit baie vinnig water absorbeer, en die kiele set uit.

By *M. pinnatifidum* is dit sonder behandeling nie so maklik om te sien dat die kielselle slym bevat nie, want die stratifikasies word eers sigbaar nadat die vrugte vir 'n paar dae in water bly lê het. Met behandeling gee die selle ook hier 'n positiewe reaksie.

In koue water duur dit net 'n paar minute totdat die vrugte van *M. pinnatifidum* en *M. herrei* heeltemaal oop is. 'n Verhoging van temperatuur verhaas die proses: as vrugte in water van ongeveer 60°C. geplaas word, gaan hulle binne $\frac{1}{2}$ minuut oop. Dis ook gevind dat vrugte wat in water oopgegaan het, binne 2 tot 3 minute weer volledig sluit wanneer hulle na 'n 1 mol. rietsuikeroplossing oorgeplaas word. Hoe flouer die suikeroplossing, hoe stadiger en minder volledig sluit die vrugte. In 'n 0·1 mol. oplossing vind geen merkbare verandering plaas nie.

Die Vrugontwikkeling

M. pinnatifidum.—(Fig. 9.)

Na die bevrugting word die vrugdak massief en duidelik vyfhoekig. Die kelkblare, veral die buitenste twee, kan nog aansienlik vergroot. Die kroonblare en meeldrade pak saam tot 'n kappievormige vliesie wat vir 'n tyd los bo-op die vrug bly lê.

Met uitdroging splits die vrugdak radiaal in die middel van elke vrugblaar oop, en op hierdie wyse ontstaan die kleppe. Die stroke waarlangs die vrugdak splits, is reeds in die jong vrug gekenmerk deur radiaalgestrekte selle wat kleiner is as in die orige dele van die vrugdak.

Die kiele. Die kiele word in die jong vrug gedifferensieer uit endokarp. Weerskante teenaan elke tussenskot, in die hoek tussen die vrugdak en laterale vrugwand, neem die selle van die endokarp baie in hoogte toe. 'n Kiel bestaan dus uit 'n enkele laag selle, en dit strek van die tussenskot tot byna by die middel van die vrugblaar. Wanneer die vrug uitdroog, skeur die kiele los van die tussenskotte, maar bly vergroeid met die kleppe, elk waarvan dan twee kiele dra. Die kiele op elke klep is van mekaar verwyder deur die breedte van die tussenskot.

Die klepvlerke. Die klepvlerke ontstaan uit dieselfde laag as die kiele, nl. die endokarp, en die bou van hulle selle stem in hoofsaak ooreen met dié van die endokarp in die vrughokke. Die endokarp van die kleppe word opgebruik in die vorming van die kiele en klepvlerke.

Die klepvlerke ontstaan soos volg: Uit die dak van die vrugbeginsel ontwikkel in elke vrughok 'n riffie wat mediaan binnekant elke vrugblaar loop (VT in Fig. 9, a en b). Dit is reeds in die blomknop sigbaar. Hierdie riwwe is deur Eichler (1875) „falsche Scheidewände" genoem, want namate hulle dieper in die vrughokke ingroei, lyk hulle soos valse tussenskotte wat die vrughokke van bo opdeel. In 'n dwarsdeursnee bestaan elkeen van hulle uit 'n laag endokarp aan weerskante, met 'n paar lae parenchymatiese selle daartussen. Die valse tussenskotte hou tred met die ontwikkeling van die vrug; hulle neem naasteby die hele mediane lyn van elke vrugblaar in.

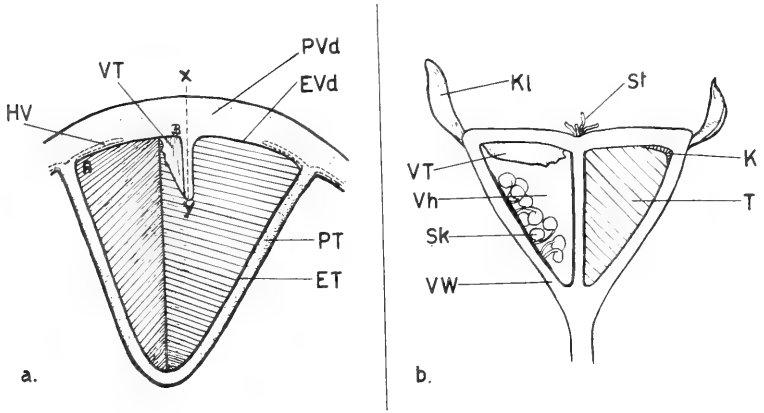

FIG. 9. (*a*) Onvolwasse vrug van *M. pinnatifidum*; vrughok tangensiaal naby die buitewand oopgesny. Die kiele verskyn nie in die snee nie. (Skematies.)

(*b*) Lengtedeursnee deur jong vrug van *M. pinnatifidum*. (ca 4 × vergroot.) ABY, deel van endokarp wat een klepvlerk vorm; ET, endokarp van tussenskot; EVd, endokarp van vrugdak; HV, hokvlerk; K, kiel; Kl, kelk; PT, parenchyma van tussenskot; PVd, parenchyma van vrugdak; Sk, saadknop; St, oorblyfsels van stempels; T, tussenskot; Vh, vrughok; VT, valse tussenskot; VW, vrugwand; XY, lyn waarlangs die vrugdak en valse tussenskot splits.

Die valse tussenskotte lê in 'n lyn met die rande van die kleppe, aangesien elke vrugblaar langs sy mediane lyn splits. Wanneer die rande van die kleppe met uitdroging van mekaar skeur, word tegelykertyd dus ook die valse tussenskotte oorlangs gesplits (lyn XY in Fig. 9, a). Elke helfte van 'n valse tussenskot bestaan nou uit een laag selle, die endokarp, waaraan gewoonlik nog reste van die parenchyma vassit. Elkeen van die valse tussenskotte gee oorsprong aan die marginale dele van die klepvlerke van twee naburige kleppe.

Die orige dele van die klepvlerke word gedifferensieer uit die deel van die vrugdak-endokarp wat tussen die basis van die valse tussenskotte en die egte tussenskotte lê, uitgesonderd natuurlik die stroke wat deur die kiele ingeneem word. Die deel van 'n klepvlerk wat direk uit vrugdak-endokarp gevorm word, is in Fig. 9a deur die lyn AB aangedui. Gedurende uitdroging skeur die genoemde dele los van die vrugdak en ook van die boonste tussenskotrande. Wanneer die vrug oopgaan, is die klepvlerke dus alleen aan die kiele vasgeheg. Die deel van die endokarp wat aan een klepvlerk oorsprong gee, is deur die lyn ABY aangedui.

Die endokarp van die valse tussenskotte (BY) en dié van die vrugdak (AB) lê ongeveer reghoekig tot mekaar. Tekens hiervan is nog in die

oop vrug sigbaar: die deel van 'n klepvlerk wat verby die rand van die klep steek (Fig. 5), is afkomstig van die valse tussenskot en vorm 'n stomp hoek met die orige deel.

Die hokvlerke. In teenstelling met kiele en klepvlerke ontstaan die hokvlerke nie uit endokarp nie. Hulle word eers laat in die vrugontwikkeling weerskante van die tussenskotte uit diepergeleë weefsel van die vrugdak gedifferensieer, d.w.s. uit parenchymatiese weefsel net binne die endokarp (HV in Fig. 9a). Met uitdroging raak 'n paar lae selle van hierdie dunwandige weefsel los van die vrugdak om die hokvlerke te vorm. Terselfdertyd skei die endokarp af van die vrugdak om die klepvlerke te vorm. Die hokvlerke lê dus vry tussen die klepvlerke en die vrugdak, en is alleen aan die boonste rande van die tussenskotte vasgeheg. Voordat die vrug vir die eerste maal oopgaan, het ons dan die toestand dat die hokvlerke deur die klepvlerke van onder bedek word. Wanneer die vrug oopgaan, word die klepvlerke van onder die hokvlerke weggetrek. As die vrug weer sluit, is die toestand andersom en die hokvlerke word van bo deur die klepvlerke bedek.

M. herrei.

Na bevrugting verleng die vrugsteel nie opvallend nie. Die dak van die jong vrug word massief en konveks, met vyf radiale riwwe daarop. Die meeldrade en kroonblare is betreklik lank blywend en vorm nie 'n kappievormige vliesie op die vrug nie. Die kelkblare vergroot effens en buig oor die vrug.

Die kiele. Hulle ontstaan op dieselfde wyse as by *M. pinnatifidum*, maar net langs nou stroke weerskante teenaan die tussenskotte, sodat die kiele smaller is as by *M. pinnatifidum*. Hulle is egter hoër as by l.g., en op die plekke waar hulle later losskeur van die tussenskotte, laat hulle die boonste rande van die tussenskotte vry van endokarp.

Die klepvlerke. Ook by *M. herrei* ontstaan die klepvlerke gedeeltelik uit valse tussenskotte, soos by *M. pinnatifidum* bespreek is, en gedeeltelik deurdat die klep-endokarp in sekere stroke afskei. Die valse tussenskotte neem hier nie die hele mediane lyn van die vrugblare in beslag nie, maar alleen die stroke naaste aan die sentrum van die vrug. By *M. herrei* skei die endokarp alleen aan die punte van die kleppe af van die vrugdak, sodat die klepvlerke kleiner is as by *M. pinnatifidum*.

In die vorming van die kiele en klepvlerke word hier dus nie die hele endokarp van die klep opgebruik nie.

Die hokvlerke. Hulle is swakker ontwikkel as by *M. pinnatifidum*, maar ontstaan op soortgelyke wyse uit binne-parenchyma van die vrugdak.

ERKENNING

Graag wil ek hier my opregte dank uitspreek aan Dr. M. P. de Vos, wie se belangstelling en wetenskaplike leiding gedurende hierdie ondersoek vir my uiters waardevol was.

SUMMARY

Micropterum is a small mesophytic genus of the Aizoaceae. The subject of this paper is a short study of the two species in the subgenus *Aethephyllum* (N.E.Br.) Schwant., viz. *Micropterum pinnatifidum* (L.f.) Schwant. and *M. herrei* Schwant., with reference to the morphology and ontogeny of the flower and fruit, and the opening mechanism of the latter.

Both species are herbaceous annuals occurring mainly on mountain slopes in the winter rain region of the Western Cape. They are the only species of Aizoaceae with pinnatifid leaves and are very similar in habit and morphology of the vegetative parts, but differ considerably in the structure of the capsule.

The 5 calyx segments are in both species arranged in a 2/5 spiral. When the calyx has been initiated, the first 5 stamens are formed on the circumference of the growing point, alternating with the calyx segments. More stamens may be—and in *M. herrei* usually are—formed outside the first whorl, mainly in the sections alternating with the carpels. The latter are initiated immediately after the first staminal primordia and alternating with them. The petals are formed in 2 to 3 whorls, on the whole circumference of the growing point.

It appears that in *M. pinnatifidum* and *M. herrei* the carpels are sterile and form only the roof of the ovary and the stigmas. The placenta of the inferior, mostly 5-locular ovary is initiated on the central axis and is transferred to its ultimate parietal position by means of intercalary growth and elongation in certain parts of the receptacle. At no stage is the placenta in direct contact with the carpels. The inferior position of the ovary is brought about by intercalary cell divisions and elongation in the receptacle below the attachment of the petals and the stamens. The ultimate epigynous position of the calyx is probably due only to cell elongation in the peripheral parts of the receptacle.

When wetted, the capsules of *M. pinnatifidum* and *M. herrei* open by means of five valves, each of which bears two expanding keels on its inner face. The keels consist of flattened elongated cells containing mucilage which, through its strong affinity for water, causes the distention of these cells, thus forcing the valves open. The capsule of *M. herrei* differs from that of *M. pinnatifidum* mainly in that the expanding keels,

and the cell wings on the upper margins of the dividing septa, are much less conspicuous.

The expanding keels and valve wings are one cell layer in thickness and are both modifications of the endocarp, i.e. the smooth inner layer lining the locules. The valve wings are formed partly from the endocarp of the valves themselves, and partly from the endocarp of the "false septa", one of which occurs on the inner face of each carpel, along its median line. These false septa are split lengthwise when the valves separate, as each valve is composed of the two halves of adjacent carpels. The cell wings consist of several layers of parenchymatous cells, and they are differentiated from deeper lying tissue of the valves.

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A NEW ALOE FROM THE RED SEA HILLS, SUDAN

By G. W. REYNOLDS

(With Plates XIV—XVI.)

Aloe sinkatana Reynolds. Species nova, *A. Campero* Schweinfurth affinis, sed acaule non frutescente, racemis capitatis gemmis horizontaliter patentibus differt.

Planta acaulis. *Folia* 16—20, rosulata, 50—60 cm. longa, 6—8 cm. lata, sensim attenuata; *supra* canaliculata, *subtus* convexa, utrinque immaculata vel maculata; ad margines linea rubra cincta, dentibus deltoideis 2—3 mm. longis, 15—25 mm. distantibus armata. *Inflorescentia* paniculata, 5—6-ramosa, 75—90 cm. alta. *Racemi* capitati, 4—6 cm. longi, 7 cm. diam., gemmis horizontaliter patentibus. *Bracteae* parvae, 3—4 mm. longae, 2 mm. latae, scariosae, 1—3-nervatae. *Pedicelli* 18 mm. longi. *Perianthium* clavatum, coccineum aurantiacum vel luteum, 22 mm. longum, circa ovarium 5 mm. diam., hinc clavatum; *segmenta exteriora* per 9—10 mm. libera, 3-nervata, interiora latiora, carinata. *Antherae* 3—4 mm. exsertae. *Stigma* demum 5 mm. exserta. *Ovarium* 6 mm. longum, 3 mm. diametro (Plates XIV—XVI.)

Sudan. Sinkat, fl. luteo et croceorubro, 11 September 1868, Schweinfurth 206! (K); Kassala Province, Beja District, Red Sea Hills, between Sinkat and Summit, *c.* 18° 47′ N., 36° 49′ E., 2890 ft., 4 April 1956, Reynolds 8020 holotype (PRE), isotype (K, Khartoum); between Carthago and Khor Amat, 7 miles west-south-west of Erkowit, *c.* 18° 45′ N., 37° 03′ E., 3,200 ft., scarlet flowers, 5 April 1956, Reynolds 8029 (PRE, K), yellow flowers, Reynolds 8030 (PRE, K, Khartoum).—*Note*: Schweinfurth 274! 275! Wady Sarranib (Sarroweet?) between Sinkat and Erkowit, fl. 17 September 1868 (K) might be an outlying form with racemes much longer than usual.

A. sinkatana is named after the locality which appears to be its specific centre. It occurs abundantly near Sinkat at 2,800 ft., northwards for 8 miles to Gebiet, southwards to Summit, and eastwards across the flats—especially between Carthago and Khor Amat—to hills near Erkowit. A few plants (not flowering) collected by Mahomed Osman near a khor leading up to Jebel De-eb, 2 miles south-east of Erkowit at 3,600 ft. appear to belong here.

These localities are in the Beja District, Red Sea Hills, Kassala Province, Sudan, in an area of erratic rainfall averaging only 5 inches per annum. *A. sinkatana* is rare in the higher hills near Erkowit and was not seen in the bleak hills east of Gebiet, or down to Suakin.

Plants were found in the largest numbers in flat sandy stony khors and wadis (small to larger ephemeral water-courses) and sometimes with *Euphorbia abyssinica* and *Dracaena ombet* nearby; not seen on rocky slopes.

Schweinfurth discovered this species in 1868. In "The Heart of Africa" vol. I, p. 27, London 1873, he records: "Halfway between Singat and Erkoweet we halted in a wady which bore the name of Sarroweet. Nothing could be more pleasant than the shade of the acacia, nothing more striking than the abundance of bloom of the Abyssinian Aloe transforming the dreary sand-beds into smiling gardens . . . . yellow and red were the Aloes, and in such crowded masses that I was involuntarily reminded of the splendour of the tulip beds of the Netherlands."

Schweinfurth's n. 206! (in Kew) was gathered at Sinkat on 11 September 1868. He regarded it as being *A. abyssinica* Lam., but it is not this species.

The identity of *A. abyssinica* Lam. has been discussed in this *Journal* 22: 151 (1956). The Sinkat species bears little or no resemblance to the material of *A. abyssinica* so named by Lamarck himself in the Lamarck herbarium in Paris.

A. sinkatana is perhaps nearest allied to *A Camperi* Schweinf. (=*A. eru* Berger) in bracts, pedicels and clavate flowers but the latter is shrubby with stems up to 1 met. long, and has racemes twice as long as broad with suberect buds. *A. sinkatana* is acaulous and not a shrub. It sometimes occurs singly but mostly forms groups, and bears capitate somewhat corymbose racemes with the youngest buds spreading horizontally. The leaves are dull grey- to bluish-green, more suberect, and are not so recurved as in *A. Camperi*.

Schweinfurth found plants in full bloom in September 1868, but Dr. K. N. G. MacLeay saw none flowering near Sinkat on 7 October 1956. Early in April 1956—which is near the end of the dry season—I found several plants in flower but the majority were then in fruit or seed. Leaves were almost devoid of sap and were thin and leathery with their margins rolled inwards. In cultivation, leaves become much more fleshy.

PLATE XIV. *Aloe sinkatana* Reynolds.
In a sandy, pebbly watercourse near Sinkat, Red Sea Hills, Kassala Province, Sudan, c. 18° 47′ N., 36° 49′ E., c. 2890 ft. Height 90 cm. Fl. 4 April 1956.

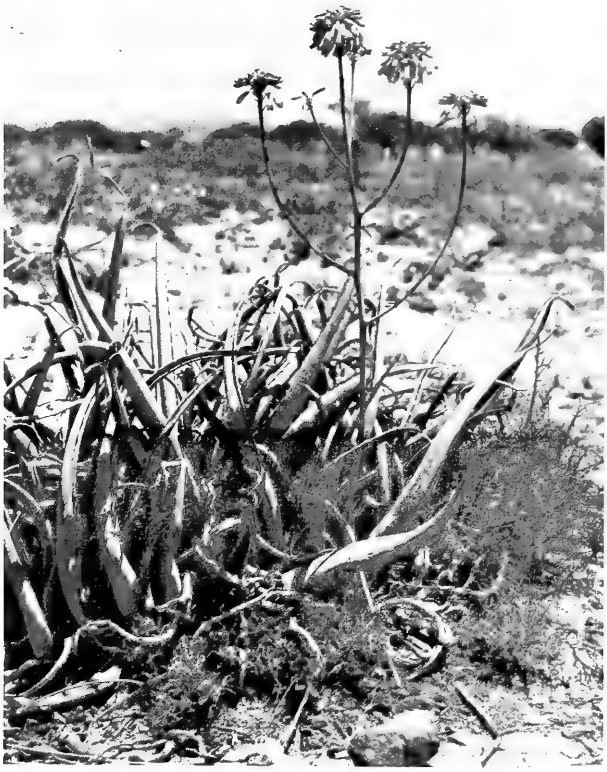

PLATE XV. *A. sinkatana* Reynolds.

Between Carthago and Khor Amat, 7 miles west-south-west of Erkowit, Red Sea Hills, Kassala Province, Sudan, c. 18° 45′ N., 37° 03′ E., c. 3200 ft. Height 75 cm. Fl. 5 April 1956.

FIG. 1.

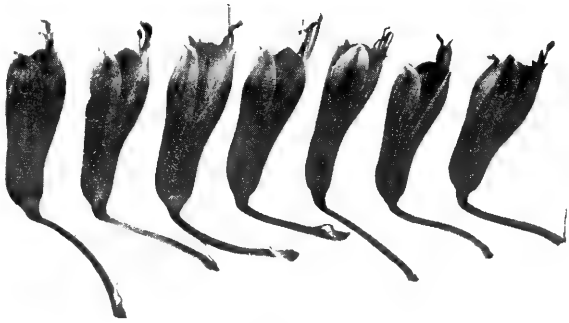

FIG. 2.

PLATE XVI. *A. sinkatana* Reynolds.
FIG. 1. Flowers 1/1, from bud to post-pollination stage.
FIG. 2. Flowers 1/1, from various plants at random, showing variation.

The Hadendowa name for *A sinkatana* is *Kalandoy*. They use the sap for stomach troubles.

Description: *Plant* succulent, acaulous, growing singly or in groups.

Leaves 16—20, somewhat leathery, densely rosulate, erectly spreading, 50—60 cm. long, 6—8 cm. broad at base, gradually tapering to a narrowly rounded apex which bears 3—5 very small reddish teeth; *upper surface* canaliculate, dull grey-green, mostly without spots but sometimes spotted throughout; *lower surface* rounded, dull grey-green, without spots or sometimes copiously spotted in lower half, the spots dull white, lenticular, 5—10 mm. long, 1—2 mm. broad; *margins* sometimes involute, usually with reddish edge armed with pale-red teeth 2—3 mm. long, 15—20—25 mm. apart, the teeth firm to subpungent.

Inflorescence a branched panicle 75—90 cm. tall.

Peduncle brown with a bloom, plano-convex and 15—20 mm. broad at base, somewhat laterally compressed to the first branch, 5—6-branched from about the middle, the branches arcuate-ascending.

Racemes capitate or subcapitate, densely flowered, the terminal averaging 4—6 mm. long, 7 cm. diam., somewhat corymbose, youngest buds horizontally disposed, open flowers nutant to subpendulous.

Bracts small, about 3—4 mm. long, 2 mm. broad, thin, scarious, white, 1-nerved or with 3 crowded nerves appearing as 1-nerved.

Pedicels 16—20 mm. long (18 mm. the average), arcuate-spreading with apex nutant, the colour of the base of the perianth.

Perianth scarlet, orange or yellow, clavate, averaging 22 mm. long, basally obconic and shortly stipitate, 5 mm. diam. across the ovary, thence enlarging to an open mouth; *outer segments* free for 9—10 mm. (tube 12 mm.), 3-nerved almost to base, thinner at the edges, the apices subacute; *inner segments* themselves free but dorsally adnate to the outer for half their length, broader than the outer, with 3 crowded nerves forming a slight keel, the apices more obtuse and more spreading than the outer.

Filaments filiform-flattened, pale lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 3—4 mm.

Style pale yellow, with *stigma* at length exserted 5 mm.

Ovary pale olive, 6 mm. long, 3 mm. diam.

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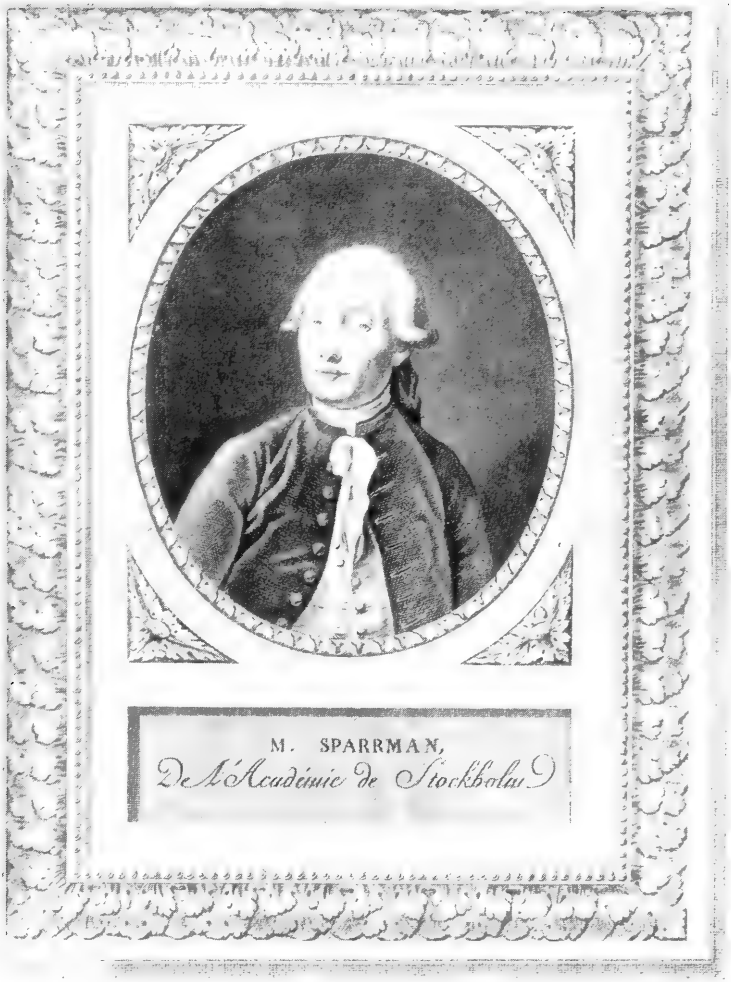

Plate XVII.

Anders Sparrman.

A portrait drawn from nature by Mollard and engraved by Hubert. From: André Sparrmann, *Voyage au Cap de Bonne-Espérance*, etc. (transl. from the Swedish original). Paris 1787.

SPARRMAN AS A CORRESPONDENT

With a portrait (Plate XVII.)

By Mia C. Karsten.

Introduction.

The Swede Anders Sparrman was one of the prominent eighteenth century botanists-travellers who took an active part in the botanical investigation of the Cape. He met his kinsman Carl Peter Thunberg at the Cape, but unlike the Englishman Francis Masson, he did not accompany him on any journey into the interior of the Colony.

Sparrman was born the son of a vicar at Tensta in Uppland in 1748, and died in Stockholm in 1820. He studied medicine at the University of Upsala, where he befriended Thunberg. But gradually he got greatly interested in natural history. It was his good fortune that brought him into contact with Carl Gustaf Ekeberg (1716—1784), one of the most famous sea captains in the service of the Royal Swedish East-India Company. Ekeberg has made no less than ten successful voyages to the far East, six of which as the ship's master. He was also a very keen naturalist and is known to have brought home from China valuable plant collections and other "naturalia". He even managed to take the first living tea plants to Sweden, which were presented to Linnaeus. The year 1761 saw his election as a member of the Swedish Academy of Science. As to his connections with Sparrman, he happened to have his property Altomta in the same parish in Uppland. Somehow he got interested in young Sparrman, which resulted in the latter's first long voyage. It was in 1765 that Sparrman, then a youth of 17 and a medical student, was taken by Captain Ekeberg on a voyage to Canton in China, in the capacity of the ship's surgeon (!), from which he returned in 1766. A few years later, in 1770, during a short visit to the Cape, Ekeberg made it his business to obtain permission to send thither a naturalist. Having noticed on the China journey the turn Sparrman had for natural history, Ekeberg would have liked him to go to the Cape as well. In 1771 he discussed the matter with the directors of the East-India Company. He emphasized that the voyage was likely to be of service to science. Linnaeus who heard of this with "peculiar pleasure", as we read in the Preface of Sparrman's *A Voyage to the Cape of Good Hope*, etc., drew up a petition for the voyage

to be made, in conformity with the statutes of the Company. The request was granted and it was ordered by the directors that SPARRMAN should be given free passage from Gothenburg to the Cape, together with every convenience, in one of the Company's vessels, the *Castle of Stockholm*. On January 10, 1772, the ship sailed for the Cape, and on April 12 she came to anchor in Table Bay. Next day SPARRMAN for the first time set foot upon African soil. The first thing he did was to wait upon the Governor, Baron JOACHIM VAN PLETTENBERG, who kindly offered him the privilege of practising medicine. Later on he went to see the Resident at False Bay, referred to as "M. Kerste" in his *Voyage*. This must have been JOHANNES FREDERIK KIRSTEN* who was Resident at Simonstown (on False Bay) until 1774. As stated on one of the documents in the custody of the Cape Archives, KIRSTEN was often used by the Governor on various duties with foreigners, which leaves very little doubt as to the identity of the Resident at False Bay. But we fail to understand how SPARRMAN came to the statement (see *Voyage*, Vol. I, p. 13) that the Resident had been promoted Lieutenant-Governor, as the office of lieutenant-governor did not exist at the Cape in the time of the Dutch East-India Company.

The Resident who had been approached by Captain EKEBERG about sending a naturalist to the Cape, promised SPARRMAN that he would keep to what had been agreed with regard to scientific investigation. However, it was arranged, in order to avoid any risk of being considered as a spy on the country and its government, whilst travelling about the country looking for plants, insects, birds, etc., that he would instruct the children of the Resident in geography, French and mathematics. At the same time SPARRMAN was appointed interpreter between the Resident and the French who often came to Simonstown.

During the short time SPARRMAN had to stay in Cape Town, before taking his abode with the Resident, he enjoyed the company of his "old Upsal chum" THUNBERG who had arrived at the Cape on April 17, only a few days after him. They spent the time going about and botanizing together, but only too soon SPARRMAN had to leave for False Bay in order to begin his duties as a tutor. Very much to his regret, for he writes: ". . . by which means I lost the company of my countryman, who alone could make the *Cape* for me a little Sweden; and render our favourite study, which we both applied to in common, still more easy and delightful" (*Voyage*, Vol. I, p. 17). SPARRMAN stayed at False Bay for the winter months, during which period he explored the country near the Bay. Unlike THUNBERG, in whose *Travels in Europe, Africa and Asia* botany is in the forefront of his interests (his volumes yield a wealth of botanical

*His first name, JOHANNES, also appears as JOHAN or JAN in the Archives' records.

notes), SPARRMAN'S enthusiasm for botany seems to have been overshadowed by a zeal for zoology, as is shown in his *Voyage* which abounds in descriptions of birds, fishes, mammals, etc., but does not give much about the plants he encountered on his journeys. Most of the botanical notes are to be found in Vol. I, in his description of his first stay at the Cape. May we quote here what SPARRMAN tells us about some of the wild flowers he saw on his excursions near False Bay in the winter and early spring of 1772.

Voyage, Vol. I, pp. 27—28: "The *antholyza maura** remarkable for its flowers, half white and half black, I found on one spot only of the mountain near one of the rivulets, that trickle down just before the slaughter-house. A very small *triandrous* plant (*staminibus monadelphis*) with comparatively large but beautiful yellow flowers, in the fine part of the day adorned a large plat of ground with its open blossoms, which however at other times were so entirely closed, as almost to disappear. The *calla aethiopica* delighted chiefly in moist places near the sea-shore, and was in flower the whole winter. *Proteas*, *ericas*, *cornuses*, *gnaphaliums*, *gnidias*, *echias*, *phyllicas*, *brunias*, and *periplocas*, two varieties of *myrica cerifera*, together with *cliffortias*, *thesias*, *polygalas*, *hermannias* and *asters*, were strewed promiscuously over the dry places on the declivity of the mountain. Quartered on the bare sand among these some *restios* were seen, together with divers *mesembryanthemums*. The *hyobanche sanguinea*, a *parasitic* plant, towards spring, began to throw out its blood-red tufts of flowers in the naked sand; an *osteospermum* or two, as well of the *arboreous* as *herbaceous* kind, we now and then likewise found in the bare sand. *Arctotides*, *calendulas*, and *othonnas*, throve chiefly in sandy places.

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*In a footnote it is added that this plant composes a new genus, called by THUNBERG *Witsenia maura*. This remarkable and rather rare Iridaceous plant is still known under this name. As to the other plants mentioned by Sparrman, the reader may wonder what plants are meant by some of the names given. In most cases it was clear enough what plants these names applied to. For the convenience of our reader we may give the following explanatory list.

"cornuses" = ? *Curtisia faginea*, Ait., Assegaiwood (Cornaceae); "gnaphaliums" *Helichrysums* (Comp.); "echias" or better "echiums" = *Lobostemons* (Boraginaceae); "phyllicas", misspelled = *Phylicas* (Rhamnaceae); "periplocas" = *Cynanchum africanum*, (L.) R. Br. (Asclepiad.); two varieties of the "Myrica cerifera" = most likely *Myrica cordifolia*, L., the Waxberry, and *M. aethiopica*, L. (Myricaceae); "thesias" *Thesiums* (Santalaceae); "asters", undoubtedly including *Felicias* and other Cape Composites; "arctotides" = *Arctotis* spp. (Comp.); "Calendulas" = *Dimorphothecas* (Comp.); stilbe = ?*Stilbe ericoides*, L. (Verbenaceae); "erinuses" = *Zaluzianskyas* and *Suteras* (Scroph.); "antirrhinums" = *Nemesias* (Scroph.).

There is little doubt about the identity of the small irises with a blue and white corolla, as this sounds very much like the description of a *Morea* sp. As to the very small plant, adorning a large patch of ground with its beautiful yellow flowers (characterized by 3 stamens united into one cluster) which only open "in the fine part of the day", we failed to identify this. The first plant mentioned in the above quotation, "calla aethiopica", our common Arum Lily, was later renamed *Zantedeschia aethiopica*, (L.) Spreng.

On the mountain besides *proteas*, *brunias*, *diosmas*, *ericas*, and the *stilbe*, we found *indigoferas*, *erinuses*, *selagos*, *manuleas*, *chironias* of different kinds, together with a great number of gynandrous plants. We likewise found greens and kitchen-garden plants in great plenty at this inauspicious time of the year. Towards spring, divers sorts of *ixias*, *gladioluses*, *moreas*, *oxalises*, *mesembryanthemums*, *antirrhinums*, and even various beautiful small *irises*, several inches high, with the corolla partly white and partly blue, began to push out of the ground."

From the description SPARRMAN gives of the Silver Tree, *Leucadendron argenteum*, R. Br. (introduced by him under the name "protea argentea"), we may quote here his concluding remarks (Vol. I, Sect. III (Residence at Alphen), p. 32): "This tree has at first a very uncommon, and indeed beautiful appearance. I am of opinion, however, that we should not chuse to change for it our delightful aspen-groves."

Switching over from plants to birds, just for one minute, our reader will certainly enjoy the more or less lyric description young SPARRMAN gives of one of our most picturesque birds, and which reads as follows: "On the plains before us we saw a large flock of *flammingoes* (*phoenicopt. ruber*), a species of bird of the crane kind (*grallae*) seeking their food in pools and puddles that were beginning to dry up. As they were larger than our cranes, and of a snow-white colour, with their wings of a flaming rosy hue, it is easy to imagine, what a delightful appearance they made in the green field, clad in so beautiful a livery." (Vol. I, p. 30.)

After the winter months had passed, the captains of the arriving ships preferred to anchor at Table Bay, which made the Resident's stay at False Bay no longer essential. So he moved to his homestead Alphen, about 3 miles from Constantia, and took SPARRMAN with him. By no means could SPARRMAN then have foreseen that in a very near future a chance meeting would make him leave the Cape for the most remote and barren parts of the world. From Alphen he made a trip to the Paarl, which would be his farthest afield during his stay at the Cape in 1772. Shortly before, about the beginning of September, he had taken leave from THUNBERG who was to set out on his first journey into the interior at the expense of the Dutch East-India Company.

Among the people whose aquaintance SPARRMAN had made at the Cape, was Baron VAN PREHM, a South African born, who was commander of the troops in the service of the Company. He appears to have been a man of some education. SPARRMAN tells us about him that he had visited Europe (which could not be said of most of his fellow-countrymen!) and was a lover of science. After SPARRMAN had returned from his journey to the Paarl, the ships *Resolution* and *Adventure*, destined to make a voyage to the Antarctic and round the world, were at anchor in Table Bay.

The former was under the command of the famous Captain JAMES COOK. the latter under that of Captain TOBIAS FURNEAUX (wrongly spelled Fourneau by SPARRMAN as we shall see later). COOK had taken with him on the expedition two German naturalists, the professors J. R. and J. G. A. FORSTER, father and son, and it was Baron VAN PREHM who brought the FORSTERS to Alphen in order to be introduced to SPARRMAN. which resulted in the latter being invited to sail in the *Resolution* with Captain COOK as assistant to the FORSTERS.

They sailed from the Cape on November 22, 1772, and for the next 122 days they did not see land. It was on this long voyage that they penetrated for the first time beyond the Antarctic Circle. On March 26. 1773, they dropped anchor in Dusky Bay, near the southernmost promontory of New Zealand. Over three weeks later, after having sailed along the whole of the western coast of the island, they anchored in Queen Charlotte's Sound, whither they would return twice in the course of their voyage. From New Zealand they voyaged to Tahiti ("Otaheite"). an island "sacred to love", as SPARRMAN calls it, where the *Resolution* was nearly wrecked on the coral reefs, and some more islands in the Pacific. On a botanical excursion on one of these islands, called "Huaheine", SPARRMAN was attacked and plundered by the aborigines. They went back to New Zealand, on the coast of which they were separated from the other ship, the *Adventure*, in a storm; they were to sail separately for the rest of the journey. It was near Queen Charlotte's Sound that the entire boat's crew of the *Adventure* would come to a horrible end (see SPARRMAN's second letter to THUNBERG and footnote 13). On November 25, 1773, they sailed from New Zealand again, in order to explore, during another summer season, the cold southern latitudes once more. After having passed and repassed the Antarctic Circle for the second time, they travelled in a north-western direction, crossed the Tropic of Capricorn and penetrated far into Polynesia. On this extensive voyage they visited Easter Island and the Marquesas, and discovered New Caledonia, the largest island in the Pacific next to New Zealand. On October 18, 1774. they came to anchor for the third and last time in Queen Charlotte's Sound. They left New Zealand on November 10, and now sailed over the whole ocean between New Zealand and the southernmost part of America. They anchored to the South of Terra del Fuego, and passed Cape Horn at the end of December. Then they sailed to the south-east until the ship could not make any more headway on account of the ice pack. So they left the cold latitudes behind, and after seven weeks sailing the coast of the African continent loomed up. Finally, on March 22, 1775. after a voyage of 60,000 miles and an absence of two years and a quarter from the civilized world, they came to anchor again in Table Bay.

While the ship was in port, Captain Cook, the two Forsters and Sparrman took up their abode with Mr. Christopher Brandt, "a gentleman well known to the English by his obliging readiness to serve them" (Cook, *Voyage towards the South Pole*, etc., Vol. II, p. 265). Elsewhere we found a short note about Brandt, informing us that he was an officer of the Dutch East-India Company in charge of False Bay (*Voyage round the World with Captain James Cook, by Sparrman*, (p. 205), publ. by Golden Cockerel Press).

During the greater part of the winter Sparrman stayed in town, practising physic and surgery, and preparing for his contemplated long journey into the interior. He could finance the expedition with the money he earned as a physician and by selling for 60 ducats (£27) his translation of a Swedish treatise on the Diseases of Children (see Sparrman's second letter to Thunberg and footnote 23). Besides, his means had been "farther fortified by a lucky speculation in commerce" (*Voyage* ,Vol. I, p. 114). Among the things Sparrman had to purchase for the journey were a "baggage-waggon" with a team of ten oxen, and a riding-horse for his personal use.

Sparrman had made friends at the Cape with a young man named Daniel Ferdinand Immelman, whom he would have liked to go with him on his expedition. He approached his parents (and lovely sister!) on the matter, and apparently it took some persuasion to get their consent. Young Immelman happened to have very weak lungs, so after all it was agreed that "the best remedy for him would be to take a long journey on horseback, especially as he had the advantage of being accompanied by a physician" (*Voyage*, Vol. I, p. 116). We have no doubt about it that Immelman whose father, an experienced soldier, then served as a lieutenant in the garrison at the Cape, was the very same youth who accompanied Thunberg on his first journey into Caffraria (September, 1772—January, 1773). It is rather amusing what Sparrman tells us about him in Vol. II, p. 137, of his *Voyage*. After having described his handsome and bearded appearance, he informs us that Immelman "figured on horseback in a long night-gown, with a white night-cap."

On July 25, 1775, they rode from the Cape.* They reached Warm Bath (Caledon) within a couple of days, and after a month's stay at the baths, they moved on to Swellendam, where they arrived on September 2, and only stayed the night. Continuing their journey, they crossed the Great Brak River beyond Mossel Bay. Retracing their steps a short

*The following brief explanatory survey of Sparrman's journey we have taken from Mr. Forbes's paper on Sparrman's travels, published in the S.A. Geographical Journal. The author by explaining the position of the localities mentioned by Sparrman (sometimes under a name which is now obsolete) gives a clearer picture of the route followed by this Swedish naturalist-traveller.

distance, they went through the Attaquas Kloof and made their way eastwards beneath the northern slopes of the Outeniqua Mountains, and down the Lange Kloof to Leeuwenbosch (near Humansdorp). When they reached this point they had been on the way for about four months. From Leeuwenbosch they passed by the Zwartkops saltpan, the Sundays and New Years rivers to the outpost district of Agter Bruintjes Hoogte (Somerset East) on the Little Fish River. They stayed in this region for three weeks, and on January 21, 1776, they departed for the Great Fish River in the vicinity of Cookhouse, which would be their farthest point. On February 6 they set out on their return journey. They travelled by much the same route and on April 15 they arrived again at the Cape. Shortly after SPARRMAN sailed for his home country Sweden.

In his description of the journey into the interior SPARRMAN mentions the "Essen-bosch" in the region near Lange Kloof which he visited at the beginning of November, 1775. The Cape ash (Dutch "es") has nothing in common with the European ash-trees, but represents an altogether different genus, belonging to the Meliaceae. It is a monotypic genus, first described by SPARRMAN in the Kongl. Vetenskaps Academiens Handlingar, Stockholm (Transact. of the Royal Academy of Science) and named *Ekebergia* (with sole species *E. capensis*, Sparrm.) "in compliment to the Chevalier CHARLES GUSTAVUS EKEBERG, Member of the Royal Academy of Sciences, and Knight of the Order of Vasa, who was the occasion of my making this voyage; and who, by his zeal for natural history, and the great pains he has been at in promoting it, is highly deserving of this distinction." (*Voyage*, Vol. I, p. 311).

SPARRMAN's merits as a botanist were recognized by the younger LINNAEUS who named after him the South African genus *Sparrmania* (Tiliaceae), of which *S. africana*, L. f. is best known, and also a Cape *Erica*, viz. *E. sparrmani*, L. f. Note the correct spelling of both names.

The younger FORSTER has dedicated to SPARRMAN his work on the scientific results of the voyage round the world, etc., *Florula Insularum Australium Prodromus* (Göttingen, 1784).

On December 14, 1775, the University of Upsala bestowed on him *in absentia* the degree of Doctor of Physic (=Medicine). At that time SPARRMAN had reached the Assegai Bosch at the foot of the Tzitzikama Mountains (Eastern Cape). On his return home he was made a member of the Royal Academy of Science at Stockholm. After the death of the Swedish entomologist Baron DE GEER, who had bequeathed his extensive collection of "natural curiosities" to the Academy, SPARRMAN was appointed "inspector" of it, or "conservator" as we would call it now. About the same time the King invested him with an honorary professorship. In 1781 he was appointed professor of natural history at Upsala University.

Whilst collecting biographical records of the trio THUNBERG-SPARRMAN-MASSON, a Swedish correspondent, Dr. HJ. ARVID UGGLA of Upsala, well-known for his publications on the life and work of the great LINNAEUS, drew our attention to two sets of SPARRMAN letters he had come across. The one set, in the custody of the Upsala University Library, under No. G 300 ä, comprises four letters SPARRMAN wrote to THUNBERG. The other set, in the possession of the Linnean Society in London, numbers eight letters to LINNAEUS, one short note to the Secretary of the Swedish Academy of Science, WARGENTIN, and a fragment by the younger LINNAEUS, viz. an introduction to a paper published in the Academy's Transactions about *Erica sparrmani*. Dr. UGGLA most kindly undertook to translate this correspondence from the original Swedish into English on our behalf, and this must have been a rather tricky job. As Dr. UGGLA points out, SPARRMAN's Swedish was not easy to translate; it is rather irregular and written in a whimsical way. Of the four letters written to THUNBERG he gave a practically unabridged translation. In one or two places only some further remarks (obviously of minor interest or maybe not quite suitable to be printed . . .) have been left out. As to the other set, the letters to LINNAEUS, Dr. UGGLA has mostly reproduced them in the third person, but without much curtailing. In these letters SPARRMAN also deals with various zoological specimens, collected at the Cape and elsewhere.

This correspondence needed a good deal of editing and annotating. I have been able to trace all people but four mentioned by SPARRMAN. Short biographical notes about the persons in question have been added. I went through Dr. UGGLA's translation at his request, and in various places I have had to deviate from the literal translation for the sake of clearness. All that has been inserted by the translator and myself in the verbally reproduced letters (viz. in the first person) and in the various quotations has been put between square brackets.

These letters which have not been published before, give a remarkable portrait of the man SPARRMAN, who, apart from natural history, showed a keen interest in the fair sex (not very particular about "colour"!) and also in money, of which he wanted to gather a good deal. But it may serve as an excuse that he was a high-spirited young fellow of 24 when he first arrived at the Cape and later set out on his voyage to the Antarctic and round the world. The way he addresses THUNBERG in his letters sometimes sounds a little sarcastic or even mocking. SPARRMAN might well have been envious of his "Upsal chum" THUNBERG, the "father of Cape Botany", who definitely was a far better botanist and also a more educated man. When he suggests that THUNBERG should let him have his observations at the Cape to be included in a publication of his own (see his letter

of March 27, 1775), he obviously puts himself on one level with THUNBERG. For the rest SPARRMAN seems to have been an amenable young man, well liked by his friends and fellow-travellers. The relations between him and the FORSTERS were quite amicable. When the *Resolution* sailed for England from the Cape in April, 1775 (three months before SPARRMAN left on his journey into the interior), GEORGE FORSTER (the son) wrote among other things: ". . . after taking leave of all our friends, and particularly of Dr. Sparrman, who had shared the perils and distresses of our voyage, and whose heart had endeared him to all who knew him, we came on board on the 27th in the morning". (Quoted from OWEN RUTTER'S Introduction to *A Voyage round the World with Captain James Cook . . . by Anders Sparrman*).

I want to express my grateful thanks to Dr. UGGLA for presenting me with these two sets of letters, and the trouble taken in translating them from the Swedish. A portrait of SPARRMAN reproduced herewith I also owe to his kindness. Further I am indebted to Prof. ROB. E. FRIES of Stockholm, and the Chief Librarian of the Cape Archives at Cape Town for some biographical records, and Dr. JOHN HEWITT, Director of the Albany Museum at Grahamstown, for some zoological information.

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I. ANDERS SPARRMAN TO CARL PETER THUNBERG.

FIRST LETTER.

(Upsala University Library, G 300 ä.)

Caput B: spei: d.—Novembris 1772.[1]

Please accept my cordial and thousandfold thanks for all proofs of friendship you have given me both on Swedish and African soil. I am particularly sensible to all your friendliness here because of my plans which will have been carried out already by the time you get this letter. It is an enterprise in which I should well have needed such a candid friend's advice like yours, dear Sir. But I guess you have already been told that I would go with the English to the South Pole and further round the Earth. What do you think of this? This I will know only two years from now . . . *if* my grave will not be at the South Pole! But I much regret that then [after the voyage round the world] I shall not meet you here [at the Cape]. Well then, let me have a reliable address and I will come to Japan after you. However, time is short now, therefore I will only let you know in a few words the reasons of my decision which are the following:

1) botanizing here *en maître d'école*[2] is about the same as going to a feast and gnawing the flesh from a bone. The school dust gets on your chest, and flogging vocables and triangles into children is an irksome job;

2) Curiosa Capensia will certainly be well-known without my help, as there are now so many "commissioners" here, thanks to this clever Dr. Thunberg who has penetrated into the heart of Africa, with attentive

[1] No date given.
[2] As a school master.

eyes and more talent than any that may ever be coming. This, as also Oldb:[3] has seen, I have written to the Archiater[4];

3) If I succeed, I shall be trained by daily work in N: H: [Natural History] alone, by intercourse with the solid Forsters and by means of a costly library. Besides, I can learn to draw and make myself familiar with the English language, etc. Certainly there will be some place in India, later on, where a botanist is needed, Ceylon e.g. [sic!], and then I would go thither. At that place I should not be ashamed for what I did [??]. I am 24 now, there is still time for me to spend in India, God willing. And if I would return to England, surely some expedient will turn up. Both the Forsters I am going with are German-born and very honest people. They try to render my voyage as comfortable and pleasant as their own, and they give me 100 Ducats as a yearly salary for such little help as I can give them, but this only between you and me. I do not want anybody to know about it. There is nobody else who knows about it more than you [? this is not quite clear]. This [salary] is not much, but during the voyage not a farthing will be spent. I have not got a separate cabin, but must live in the cabin where the library is and where meals are served. But I use the Captain's or the botanists' cabin if I want to write. We shall never have more than a two months' voyage before we get to land and find plants such as I could never get otherwise. But I hope to be allowed to exchange with Dr. Thunberg for [specimens of] the Cape flora. The English way of living is much more reasonable than the Dutch, and even better in some respects than it is on the Swedish ships. The Captain seems to be a very honest fellow and is the same as the one Solander went with. My dear friend, do write a lengthy letter about your doings and leave it here until I return. If I die, let some tears fall on my memory in your Hist. C. B. Sp. [History of the Cape of Good Hope], and do not forget that I am your very sincere friend. Think of me in Japan as I will do of you at the South Pole.

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[3] This is Franz Pehr Oldenburg, a fellow-countryman of Sparrman and Thunberg. We cannot find any records as to the year of his arrival at the Cape, but we know that in 1772 he was Thunberg's indefatigable companion on the Cape Peninsula. Towards the end of that year he set out with Francis Masson on the latter's first journey into the interior (December 10, 1772—January 18, 1773), on which he collected a great number of plants. In 1774 he went to Madagascar, on recommendation of Thunberg, where he made several collections of plants. But he was never to return from that island, as he was stricken by a malignant fever from which he died. Oldenburg was a soldier by profession, but when he embarked on his Madagascar journey, he had been practising botany for the space of two years. In 1772 he collected about 1,000 specimens of Cape plants which were obtained by Banks and are now kept in the Herbarium of the British Museum (South Kensington).

His merits as an investigator of the Cape flora were acknowledged by Lessing who named after him the handsome South African genus *Oldenburgia* (Compositae). In the vicinity of Grahamstown the interesting *O. arbuscula*, DC. is a rather common feature on outcrops of rock. It is a low shrub with dark green leathery leaves which are very hairy underneath, like soft white felt.

Abt. Oldenburg, see also this Journal, Vol. V, October, 1939, p. 136 (footnote).

[4] Carolus Linnaeus or Carl von Linné.

I now send my duplicates to the Archiater Linné; there will certainly be no new ones among them, for Oldenb: says that he has sent to Bergius[5] all such as you have told him to be new. A Triandrist with yellow flower and hexagyne,[6] which I have drawn and described, has been sent to the English Acad. of Science under the name of *Forstera*[7] . Only recently I found a new genus at the Cape. 5dria . . .[8] like your Oxalis simplex. N.B. Pistilli basi sunt coherentes[9] etc. and bigger. It can never be Moraea as it seems to me?—The Forsters have described and drawn a multitude of new animals in the Garden, they have bought birds more than I have seen here.—If anything is seen on the Sea, a barge is sent out to find it, such is amusing . . . They are not jealous, but communicate their observations and descriptions to v. Linné. They have excellent knowledge about animals as well as insects, and where plants are concerned they are not much lacking [in knowledge].

But farewell then, dear Friend, God bless us both and let us once again botanize together, if not before, then on the Elysian Fields.[10] May Heaven favour your enterprises to your delight and advantage! This is the wish of your sincere friend And. Sparrman.

P.S. Please remind my gardener of sending plants to Captain Ekeberg. If some drugs are sent to me, please render your help in having them sold. If iron spades arrive, have them stored until my return, D.V. [Deo volente, God willing]—the drugs may be stored as well.

This letter was addressed to:

Monsieur
Monsieur Pierre Thunberg
Docteur en medicine
t'huys Bey Myn Heer Fhcesse[11]

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[5] Peter Jonas Bergius (1730-1790), a compatriot of Sparrman, was a medical doctor and an outstanding figure in the botanical world. When at college at Upsala he was so captivated by the lectures of Linnaeus, that he decided to devote himself especially to botany. Having finished his medical studies in 1753, he set up at Stockholm where he got a large practice and kept working until his death.

The year 1761 saw his appointment as a professor of natural history.

Bergius who may be ranked as one of Thunberg's best friends and helpers at home, is the author of *Descriptiones Plantarum ex Capite Bonae Spei* (1767), our first Cape flora. See also this Journal. Vol. V, July, 1939, pp. 92—93.

[6] A yellow flower, triandrous (3-stamened) and hexagynous (with 6 pistils).

[7] The genus *Forstera*, L.f. (Candolleaceae, for the greater part Australian plants) belongs to the flora of Tasmania and New Zealand.

[8] 5dria=pentandrous (5-stamened).

[9] Pistils united at the base.

[10] Pre-hellenic paradise.

[11] This is Mynheer Hendrik Fehrsen, at whose home Thunberg took a lodging when he arrived at the Cape in April, 1772.

SECOND LETTER.

Cape Town, March 27, 1775.

My dearest friend and patron,

Oh, may this letter reach you safe and sound before your departure for far-away Japan, this in order to let you know that *he* is still living, who wishes his friend Thunberg all kinds of happiness. On the 21st of March, 1775, according to the calendar, but the 22nd by our reckoning (for one day is gained if one goes round the world against the sun), we arrived at the Cape with the loss of three, two of them having died through an accident, the third of a phthisis [lung t.b.] of long duration. There was hardly a soul [lit. nearly nobody] who was more ill than that he could not have danced at the arrival, and the state of health [on the ship] was about as good all the time. I know that you, Sir, have predicted *multum sinistri*[12] on this point, therefore I am first of all anxious to prevent such ideas.—But then let me tell you how much I was grieved to find that you had left the town before I could have had the opportunity of speaking to you, especially before you would go on another long and tiring voyage. What a satisfaction would it not have been to get a little longer letter. However, many 1000 thanks for those I received in your envelope, viz. from you and from other friends. Thank God they did not contain any bad news. But let me return to our journey. We separated from Captain Fourneau and had some recreation at New Zealand till the end of November [1773]. Then we went to 71° [of South latitude], found no land but a great deal of ice, and on the 11th of March [1774] we arrived at a not quite unknown island in the tropics, viz. Easter Island, from there we visited islands both known and unknown, and in November [of that year] we arrived at New Zealand [again], at the same spot where Capt. Fourneau's men had been eaten, without our knowing about it.[13] From there we reached Cape Horn in Jan. 1755 [a mere slip of the pen, should be 1775 of course], and discovered some islands nearly covered with snow and ice. There were two European plants only, Sanguisorba and

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[12] Much evil.

[13] COOK's *A Voyage towards the South Pole and round the World* (1779) contains Capt. FURNEAUX's narrative of his proceedings in the *Adventure*, from the time he was separated from the *Resolution*, to his arrival in England; including Lieutenant BURNEY's report concerning the boat's crew who were murdered and eaten by the inhabitants of Queen Charlotte's Sound. On the 17th of December, 1773, having refitted the ship, they sent out their large cutter, with Mr. ROWE, a midshipman, and the boat's crew, to gather wild greens for the ship's company, with orders to return that evening, but when they did not come back that evening, nor the next morning, the launch, manned with Lieutenant BURNEY, the boat's crew and ten marines, was lowered and sent in search of the cutter. They found no boat, but instead, the heads, hearts and lungs of the unfortunate men scattered all over the beach.

Dactylis,[14] which constituted the entire flora. We caught and ate penguins and sea-lions. We have got some hundred new plants only, because we went so far south. All [notes and drawings are] ready to be printed and engraved. Had it not been for the cold during the summer months in the South, the voyage would have been quite pleasant, notwithstanding an occasional dissension, for the prevention of which I found an effective method in good time. I now intend to remain here [at the Cape] on my own account for one year at most in order to cure by bathing a *herpes*[15] that appears on my hands during the winter and in cold weather. I intend to study as much as possible during this time, but how useful would it not have been to have got your instructions as to what to observe, where to go and particularly what to describe! For it would be *opus operatum*[16] to describe what you have treated in such a masterly way. Anyhow I will get to know something from Mr. Masson who is now going home to England.—Mr. Kepler[17] sends his kind regards. He will not be able to send your collections this year, because the Swedish ships went to St. Helena without calling at the Cape. He will let you know as soon as he can send them off. Mr. Masson too sends his greetings.—But why did you want to go to Japan after having already won as much honour as could ever be wished? This means to sacrifice oneself altogether—but may Heaven support you in your zealous enterprise and help you [to get] home before long. By all means don't stay more than one year in Japan, but return home as soon as possible in order to arrange your collections from the Cape. My own collection and assistance may be of some use. Do keep away from Batavia as far as possible. Buy some corn, make it into malt, take it with you to Japan, make a decoction or—which is the same—wort, and drink half a quarter of a gallon twice a day. This keeps the stomach in order, makes a healthy, robust and fat constitution, cures the Scorbut even to a high degree. This we have experienced, as to wort, during our voyage. Take at Batavia a daily dose of Peruvian bark.[18] Have a bowl with acid standing at the side of your bed etc., this according to Dr. Lind, in order to preserve [good] health in hot climates . . . [more about this subject, how to prevent meat from rotting,

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[14] *Sanguisorba*: burnet (Rosaceae). Dactylis: tussockgrass, originally described under the name Dactylis caespitosa, but later renamed *Poa flabellata*, Hook. It grows in the Falkland Islands, "wherever the waves beat with the greatest vehemence and the saline spray is carried farthest. . . " It is "the gold and the glory of its island home, where it provides food for cattle and man." (W. J. HOOKER in HOOKER'S London Journal of Botany, Vol. II, 1843).

[15] Eruption of the skin.

[16] Latin, the translation of which reads: working at a job already performed.

[17] We have not succeeded in establishing the identity of SPARRMAN and THUNBERG'S mutual friend KEPLER. All we know is that SPARRMAN took a lodging in his home in 1775 (see his letter of April 29, 1775).

[18] *Cinchona*.

etc.—transl.] Excuse me writing such things to a M.D., but, on my honour, I'd rather risk your displeasure than that you should be unacquainted with these new experiences of the English, lest you have not had the opportunity to read their papers at the Cape (which is a desert as regards the learned world). May not Science incur a loss by the decease of Dr. Thunberg just as by that of Falk and Gmelin! The former shot himself from spleen, the latter died in jail among Kalmucks or Tartars.[19] Mr. F[orster] will first publish *Genera plantarum novarum* with engravings like Tournefort's[20] with the flower opened, in different positions and magnified, even the capsule. This is rather useful. Allow me to recommend you to do the same. You will have no other pleasure than drawing, if you will be shut up in the factory[21] in Japan. Take care of the spleen and Falk's evil fate. Try and put peculiar flowers in weak spirit, if you have not time enough to draw them. I am going to try this. Please do write me from Batavia at Mr. Kepler's address, about your condition and how many plants have been sent to Burmannus[22] and to Sweden, how they will be preserved there, etc. I wish you everything that may be to your honour, and I should be glad to get your advice about this [the foregoing] before I return to Sweden and undertake anything concerning Cape plants.

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[19] Johan Peter Falck was a Swede born in 1733. In 1751 he came to Upsala where he became a disciple of Linnaeus. For some time he acted as "informator" (private tutor) of Linnaeus's son. In 1763 he went to St. Petersburg (the later Leningrad), and two years later he was there nominated medicinae and botanices professor and director of the Botanical Garden. In 1768 the Empress *Catharina II* sent him on a scientific expedition to the inner parts of Russia, where he died on March 21, 1774. Prof. Fries of Stockholm to whom we owe these biographical records, did not mention the cause of his death.

Linnaeus named after him the South African genus *Falckia* (Convolvulaceae). The only species, *F. repens*, Thunb., common throughout the Cape, was described by Thunberg in 1776.

Samuel Gottlieb Gmelin (1743—1774), son of an apothecary and surgeon in Tübingen, Germany, was appointed professor of natural history in St. Petersburg in 1766, and in the following year started on a journey through south Russia and the regions round the Caspian Sea. On his way back he was captured by Usmeh Khan, of the Kaitak tribe, and died from ill-treatment he suffered, on July 27, 1774.

[20] J. Pitton de Tournefort (1656—1708) was a French botanist who travelled extensively over Europe and Asia Minor. From his journeys he brought home a great many specimens of plants. He set up an artificial plant system based on the shape of the corolla, and provided good descriptions of genera. He became a professor of botany in Paris at the early age of 21. The genus *Tournefortia*, L. (Boraginaceae) was named after him.

[21] This sounds like a misinterpretation of the word "factory" which in this case means a trading-post, viz. the "Factorij" of the Dutch East-India Company on the island of Decima in the bay of Nagasaki.

[22] Nicolaas Laurens Burman or Burmannus (1733—1793), a physician by profession, succeeded his father Jan Burman, author of *Decades Rariorum Africanarum Plantarum* (1738—39), as a professor of botany at the Athenaeum Illustre (later to become the university) at Amsterdam. He was keenly interested in the Cape flora. Thunberg who knew both the Burmans, was very good friends with the younger Burman and his wife who extended to him the greatest hospitality during his stay at Amsterdam in the autumn of 1770 and in 1778 on his home journey to Sweden.

See also this Journal, Vol. V, January, 1939, pp. 4—18 (with portrait).

I should like to publish *Hist. Cap. B. Sp.* [History of the Cape of Good Hope] in the meantime, if I had the opportunity to enrich it with your observations. Have you got a MS of them and would you entrust them to me, with your permission to make use of them? Then your honour would grow still more [in my esteem]. Mr. Forster does not at all care about Cape plants, but animals and fishes are drawn and painted as many as possible. —Amuse yourself by learning a little of the Japanese language, and also by finding out the state of affairs among the Japanese [literally: them]. I can assure you that such will be good for the purse when you come home. During my journey I translated Rosén's[23] book on children's diseases into English. I hope this will provide my poor relations with some 40 or 60 ducats. This is one of the greatest satisfactions I have got from my voyage. My goodness, if you and I could have worked together, what pleasure and satisfaction [this would have been]! However, as Fate has otherwise disposed, may each of us succeed and work with as much pleasure as possible till we meet again on Swedish soil.

This wishes with burning desire
the most learned Mr. Doctor's
most sincere friend
And. Sparrman

P.S. I shall put away for you a collection, as complete as possible, of South Sea plants, in case you would think it worth possessing them, As for me I would like to have Japan plants and such from the Cape I have not been able to find myself.—P.S. I have also a collection of birds stuffed or in spirits, which I intend to make known.
Addressed to:

Myn Heer
d'heer Petrus Thunberg
Doctor Botanicus
tot
Batavia
Gelieve na gemelde te informeeren
in d'appoteeck of Hotel
tot Batavia[24]

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[23] A Swedish physician, called Van Rosenstein in Sparrman's *Voyage to the Cape of Good Hope*, Vol. 1 (1786), p. 114.

[24] Not entirely faultless Dutch in the spelling of those days which reads in English translation: Please inquire for mentioned person at the dispensary or Hotel [? this is not quite clear; see beginning of next letter] at Batavia.

THIRD LETTER.

Cape Town, April 29, 1775.

I hope my former [letter] has reached you. It was addressed to the Apothecary at the city gate at Batavia. Therefore I will only repeat that I am back with a whole skin, with exception of the ordinary nine holes [sic!] from the Antarctic, the southern Thule,[25] and other *terris australibus* where the entire flora consists of a poor, familiar Sanguisorba and a Dactylis. All the new [plants] from the tropical islands and New Zealand numbered some two hundred and fifty, and from between the tropics there are many already known [literally: much of old—transl.] East Indian [plants].—But let us now talk first about news brought here with the East-Indiaman from Sweden. I don't know anything of more interest than that the Academy of Science has sent 100 Riksdaler[26] to a gentleman called Thunberg who is staying at the Cape—that is how the order runs to the Supercargo Fors who had this in commission. At the recommendation of Kepler I talked to the man and asked him to let the money be paid to your order through a letter from Batavia. But Mr. Fors, as a good soldier, keeps himself *verbatim*[27] to his orders and does not go a step on his risk. All I could obtain was that he gave order to the Swedish extortioner [sic!], no, Consul I ought to say, that he should pay 100 Riksdaler to Dr. Thunberg (or Pesos, I don't know exactly), but N.B. at his return only, and, according to the order of the Company, to its "Opperscribbler" or Supercargo, when he comes and stays at the Cape. Qui bene distinguit, bene docet[28], as the metaphysica says [?]. The Royal Academy [of Sweden] is clever about books, but not cunning enough, I am afraid, to send money in such a way that lawyers and porcelain-clerks [??] may not find out some subterfuge. It was evident of course that the Academy had intended the money to be a help in your needs, but how will their intention now be fulfilled? Mr. Fors could not deny this [viz. the Academy's intention], but he excused himself on the ground of his formal orders. He is otherwise amenable and well liked. He might come back here next year. Now let me advise you to send your order to the Cape for the

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[25] Thule: Greek and Roman name for the most northerly land in the world.

[26] In a letter to THUNBERG, addressed to the Cape, dated November 6, 1774, BERGIUS writes about the 100 Riksdaler in cash, which THUNBERG would obtain as a present from the R. Academy of Science. As a matter of fact Capt. EKEBERG had written to BERGIUS that THUNBERG was not paid in the Dutch service as he ought to be. Over a year later, December 25, 1775, BERGIUS sent another letter to THUNBERG, in which he inquired about the 100 Riksdalers sent to the Cape by means of the East-India Company (see this Journal, Vol. V, July, 1939, pp. 96—97). The Swedish Riksdaler (Rixdollar) is obviously meant here. It was a silver coin, now obsolete.

[27] SPARRMAN erroneously writes "verbotim"

[28] He who distinguishes well, teaches well.

money set apart for you (N.B. *if* you need it). If Le Fevre[29] refuses, I am sure there are others who are willing to pay on a cheque drawn on the Academy who will certainly honour it. But you have to send the letter in threefold.

Now the English have gone away whom I accompanied these 28 days [?]; I also kept them company during the 5 weeks they stayed here, that is to say in drinking and eating only[30]. Now I have moved to our common friend Mynheer Kepler in whose ark I am going to conceal myself, as long as the windows of the sky are open during the quay masong[31]. Later on, during next summer, I shall fly off like Noah's dove (N.B. on oxenwings! and "ossenwaggen") in order to bring home green leaves. Certainly I shall have the opportunity before that to reflect on the foolishness of grass-collectors who fly round the world as "dry skins" for nimmendal[32] only, while an unlearned devil of a rustic may be staying at home with his wife, ploughing and sowing. But beware of Hypochondria and Falk's fate. In order to prevent this I shall never use a pistol or a rope in the house. But—I repeat my kind advice—don't tarry more than one year in Japan. Could you with a good conscience [abandon] Sweden for another year? Remember that you are Dutch in religion only. Were it not for the painful circumcision, it would be worth while to become a Japanese for some years with the privilege to move freely [literally: to go about everywhere—transl.]. But the worst would be if one could not get away any more. However, it seems to me that it must be very bad to be shut up in a factory or on a kind of "Robbins Island". Damn their rascally blood for so doing [This was written in English—transl.] *Maar aber aber dass*[33] I doubt that this will reach you at Batavia, but if it does, let me know *cujus generis*[34] the girls are over there. Couldn't you find one who has some hundred thousands and the heart in the right place? It is of no account if she is brown as calf's skin or yellow as an omelette. It

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[29] At the Government Archives at Cape Town nothing is known of a man called Le Fevre (or Le Febre) acting as consul for Sweden during the time in question. The only person of that name, who occupied a more or less official position at the Cape during that time, was, as far as could be established, the "burgervaandrig" Jacobus Alexander La Febre, who was born at the Cape. But he is not known to have had any dealings with Sparrman.

[30] Sparrman's English companions were the men of the *Resolution*. In his *Voyage* it is stated that they stayed at the Cape for about five weeks after their ship had arrived in Table Bay. We don't understand the four weeks' companionship.

[31] "Quaade mousson" in the Dutch of those days (now spelt "kwade moesson"), badly misspelt by Sparrman. It means the bad season, viz. the rainy winter season at the Cape, reckoned from May 14th till August 14th.

[32] This is Dutch and means "nothing at all". But Sparrman's spelling is incorrect, it should be "niemendal". We can but guess the meaning of "dry skins for nothing at all": good-for-nothings perhaps ?

[33] A combination of Dutch ("maar"=but) and German ("aber dass"=but that . . .), which can be best translated in this context by: But . . . , but . . .

[34] Latin, which means of what genus. Here: what kind of . . .

seems to me that the Swedish winters and cold ought to dispose you to such a thing [!]. Would it not be better to take home to the fatherland such a precious thing than a haycart with parsley, chervil, etc. from Japan? . . . Oh, vanitas—omnia sunt vanitates![35]—Yesterday I was looking at how justice was exercised at the Gallows, to-day my benevolent host is going to introduce me to a wedding.—If things turn out successfully, I shall get the company of young Himmelmann[36] on my journey into the interior, quod Deus bene vertat![37] I shall try to make small drawings of *characteres generum* methodo Plumieriana et Tournefortiana[38]. I wished I could confer with your descriptions and names beforehand. If I could find some two hundred new [plants] which Mynheer had not seen and got, I would reckon it *bonum*[39]. I wished I could anatomize and draw the Hippopothamus[40]; I can get the necessary scalpel. Also the anatomy of the Penguin, etc. [I would like to perform]. Everything you want is damned expensive here, let alone that much your body wants cannot be had here. I prefer the South Sea and some islands there, where every shrub formed a house, and a nail was the price of love-making. But, but—the bearer tells me to hurry and does not let me tell you [any] more stories, but he must give me the time to assure you . . .[41]

P.S. it is possible that the Swedish ship puts in here on her way home, and that I go with her. Then your things could also be sent. That chaplain whom Kepler recommended so warmly, is called Barkenbom, from Gothenburg. The captain's name is Schröder, the assistants were Almroth and Conradi.

P.S. It was a good thing and a great satisfaction to learn from

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[35] Apparently SPARRMAN's Latin version of a well-known Bible text, viz. Vanity of vanities, all is vanity (Eccles. 1).

[36] DANIEL FERDINAND IMMELMAN !

[37] . . . , which God may bring to a good end !

[38] Characters of genera according to the method of PLUMIER and TOURNEFORT. CHARLES PLUMIER (1646—1704) was a French-born Franciscan friar. He was a good botanist and an excellent draughtsman. Together with his fellow-countryman J. D. SURIAN (a physician-apothecary by profession) he visited Martinique, the Western half of Haiti and some smaller islands from 1689—90, on which journey Surian collected over a thousand plants and PLUMIER made numerous drawings. In later years he undertook a second and a third journey to the West Indies, but without SURIAN. In 1703 he published an illustrated work (*Nova Plantarum Americanarum Genera*), in which he described 106 new genera and 219 new species. He was the first to restore the custom to name plants after meritorious persons, which had fallen into disuse since the old Greek authors. At his death he left no less than 6,000 drawings (including 1,200 of animals) which were distributed over various leading libraries in Europe. The genus *Plumiera* (Apocynaceae) was named after him by LINNAEUS.

[39] The Latin subst. *bonum* in the sense of "luck"; SPARRMAN would think himself lucky, if he could find . . .

[40] Incorrect spelling by SPARRMAN; it should be *Hippopotamus*.

[41] SPARRMAN's writing was broken off here by the translator. What was he going to confide to his friend THUNBERG ? Certainly no botanical matter, judging from the preceding lines !

Montin's[42] letter to you that my relations are well. This is all I have heard from them this year.

FOURTH LETTER.

Cape Town, April 22, 1776.

. . . Now at last I am able to tell you that in a way I have gained my object by staying at the Cape: 1) by using Hottentott. Holl. baths[43]; 2) by not being mixed up in the dispute that has arisen between Captain Kock[44] and Mr. Forster; 3) by being able to tell that I have also seen a Hottentotts' hovel; 4) by procuring a Cape herbarium. But I have also experienced the most droughty year which Our Lord ever sent the Dutch at the Cape. 5) As to insects and birds I can say the same [that he has procured them—transl.]. And finally (6) by dissecting the Rhinoceros and *manates*[45], etc.—But now at last: basta![46]—Eight months *de suite*[47] I have been travelling, and twice I have camped under the open sky, outside Christianity, for more than one month. Young Emmelman [!] shared my vicissitudes. Sometimes I wished it had been his fair sister instead! Now at my return there is a Swedish ship at Bayo Falso, with which I go home, D.V. [Deo volente]. I wished to God you were as far as that! I hope, however, to meet you one year from now. If then we great ones could join hands [literally: lay our heads together—transl.], the small ones would have to give up. But your Japanensia *absque dubio*[48] will surpass everything else. Take care not to refresh yourself at Batavia to such a degree that you kill yourself. That would be a very bad turn to the public. But if you could, in passing, manage to get at a capital of silver coins, then you would come back to Sweden more triumphantly! At least don't scorn a good opportunity. The greediness of the Dutch has so greatly influenced me that I wish to have daily bread, and

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[42] LARS JONASSON MONTIN was born in 1723 near Gothenburg, Sweden. In 1743 he came to Lund as a student, and two years later he enrolled as a student at Upsala University. In 1751 he took his degree as a doctor of medicine at Lund. Later on, after 1756, he was practising as a provincial medicus at Halmstad (province of Halland), where he died in 1785. During his academical life he started to collect plants, first at Lund, later on at Upsala. THUNBERG has provided him with French and Dutch plants. His valuable herbarium, numbering about 5,000 species, now belongs to the Natural History Museum at Stockholm. THUNBERG named after him the South African genus *Montinia* (Saxifragaceae). The only species, *M. caryophyllacea*, Thunb., Pepper Bush, is common all over the Cape.

[43] There is little doubt that the Caledon baths at the foot of the Zwartberg Range are meant here.

[44] As the Dutch would write COOK if they knew no better!

[45] = *Manati:* a group of herbivorous marine mammals, some being found near the coast of Mozambique.

[46] Basta, an exclamation meaning: enough! Adopted from the Spanish by the Dutch and included in their vocabulary.

[47] French, which means successively, in succession.

[48] Latin = without doubt. Your Japan plants . .

"Decatorcer"[49] to boot. It seems that your plants will not be sent home this time [=by this occasion], because Kepler keeps to your will *verbatim*. God give that you may be able to take them [literally: do it—transl.] yourself, and then come and meet your friends and wellwishers . . .

Anders Sparrman

Addressed:
Till
den widtärfarne och Wittre
Medicinae Doctoren Petrus Thunberg
Läkjare wid den Kiäjserl: Japans
Ambassaden[50]

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[49] We cannot even guess the meaning of this word. It may be a corruption beyond recognition of the Dutch word for a certain food or dish. The above utterance of SPARRMAN's sounds a little peculiar.

[50] This Swedish address reads in English translation: To the most learned and most experienced M. D. Petrus Thunberg, Surgeon to the Imperial Embassy of Japan.

THE IDENTITY OF *ALOE DELTOIDEODONTA* BAKER

With Notes on Perrier's Varieties, and with Descriptions of Three New Species.

By G. W. Reynolds.

(With Plates XVIII—XXVII.)

There appears to be no locality known in Madagascar today where *A. deltoideodonta* Bak., as described, is to be found.

The type is Baron 946! received at Kew in October 1882, from "Central Madagascar", without precise locality. This comprises one leaf and an inflorescence. A second sheet, Baron 5181! "chiefly from north-west Madagascar" comprises a whole flowering plant with a second inflorescence. The 10 cm. slender stem of this specimen is of the kind that suggests it is a sucker taken from a group, and that plants are proliferous.

Photographs of these two sheets are reproduced herein. (Plates XVIII—XIX.)

Little is known in botanical literature about the Rev. R. Baron who collected about 11,800 specimens in Madagascar between the years 1880 and 1896. Baron lived in Fianarantsoa (430 km. south of Tananarive), and collected many plants on the southern part of the ridge of high ground running south through Central Madagascar in the country known as Betsileo. The type might have been collected somewhere in this wide area, and it is not known whether it was taken from a juvenile or adult plant.

A. Rossi Todaro in *Hort. Bot. Panorm.* 2: 58, *tab.* 40 (1894) is placed by Berger in synonymy under *A. deltoideodonta* Bak., but this appears to be incorrect. Todaro states that his plant came from Madagascar and that the seeds were mixed with those of *A. percrassa* Tod. *Tab.* 40 depicts a raceme that is too densely flowered for *A. deltoideodonta*, while the leaf, which is 20 cm. long and 9 cm. broad, is much too large for *A. deltoideodonta*. The leaf also has a very prominent dentate keel dorsally throughout which is a character neither of *A. deltoideodonta* nor of *A. percrassa* which I have seen in large numbers in Northern Ethiopia and on the Kohaito Plateau in Eritrea. No species with such dentate-keeled leaves is known to me in Madagascar.

Perrier de la Bâthie does not appear to have collected typical *A. deltoideodonta* anywhere in Madagascar, and he cites no material of his

own collecting either in *Mém. Soc. Linn. Norm.* 1: fasc. 1 (1926) or in *Fl. Madag.* Liliac. (1938).

Perrier did however describe four varieties of *A. deltoideodonta* in *Mém. Soc. Linn. Norm.* (*l.c.*) namely var. *candicans*, var. *intermedia*, var. *brevifolia* and var. *contigua*.

In the light of recent investigations it seems that of these four, only the varieties *candicans* and *brevifolia* should now be upheld. The varieties *contigua* and *intermedia* differ in too many characters to be varieties of *A. deltoideodonta* and should be accorded distinct specific rank.

The purpose of this paper is, therefore, to publish photographs of Baron's material of *A. deltoideodonta* since no figures are known, and to give effect to the proposals concerning the varieties.

A. deltoideodonta Baker in *Journ. Linn. Soc.* 20: 271 (1883); Durand et Schinz in *Consp. Fl. Afr.* 305 (1893); Berger in Engler *Pflanzenr.* Liliac.—Aloin. 186 (1908); H. Perrier de la Bâthie in *Mém. Soc. Linn. Norm.* 1: fasc. 1, 24 (1926), et *Fl. Madag.* Liliac. 85 (1938).—*Non* François in *Mém. Acad. Malg.* fasc. 24: plate 18 (1937).—*A. Rossi* Todaro in *Hort. Bot. Panorm.* 2: 58, *tab.* 40 (1894) *fide* Berger (*l.c.*).

Description based on Baker's account and Baron's material:

Plant small, acaulous or with short stem, probably proliferous.

Leaves 12—16, densely rosulate, lanceolate-deltoid, erectly spreading, 10—13 cm. long, 2.5—3 cm. broad, probably without spots; *margins* with continuous cartilaginous or horny narrow straw-coloured border armed with teeth of the same colour, deltoid, 2 mm. long, 3—5 mm. apart.

Inflorescence simple or 1—2-branched, 40—60 cm. tall, the peduncle slender, basally flattened and about 12 mm. broad, terete upwards.

Racemes rather narrowly cylindric-acuminate and narrowing almost to a point, 15—20 cm. long, subdensely flowered, the youngest buds suberect and almost hidden by their bracts, gradually laxer downwards.

Bracts lanceolate-deltoid, white, shorter than the pedicels, about 10 mm. long, 5-nerved.

Pedicels the lowest 10—12 mm. long.

Perianth probably scarlet and cylindric, 25 mm. long (dry), obtusely tapering at base into the pedicel; *outer segments* free for about 10 mm.

Filaments not or very shortly exserted. (Plates XVIII, XIX.)

Central Madagascar; Rev. R. Baron 946! holotype (K), 752! 5181! (K). —Received at Kew in October 1882, October 1881, and September 1887 respectively.

A. deltoideodonta Bak. var. *candicans* H. Perr. in *Mém. Soc. Linn. Norm.* (*l.c.*) 25, et *Fl. Madag.* (*l.c.*) 86.

PLATE XVIII. *Aloe deltoideodonta* Baker.
Photography of the type in Kew, Baron 946 on right. Baron 752 on left.
—*By courtesy of Dr. R. A. Dyer, Chief, Division of Botany, Pretoria.*

PLATE XIX. *Aloe deltoideodonta* Baker.
Photograph of Baron 5181 in Kew.
—By courtesy of Dr. R. A. Dyer, Chief, Division of Botany, Pretoria.

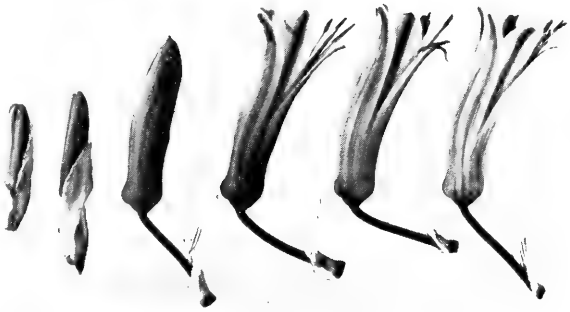

PLATE XX. *A. deltoideodonta* Bak. var. *candicans* H. Perr.
Plant from Ivohipolaka, Madagascar, flowering in Johannesburg. Height 55 cm.
Flowers 1/1 from bud to post-pollination stage.

PLATE XXI. *Aloe deltoideodonta* Bak. var. *candicans* H. Perr.
Plant from the north end of the Andringitra Range, near Mahasoa, flowering in Johannesburg. Height 60 cm.
Flowers 1/1 from bud to post-pollination stage.

Differs from the type in having much larger leaves, shorter more conical racemes, longer and broader snow-white brittle bracts that are usually longer than the pedicels.

Description based on observations in Betsileo, Madagascar, and on plants flowering in Johannesburg:

Plants with little or no stem, usually forming dense groups 1—2 m. and more across.

Leaves 12—16, rosulate, compactly ascending, lanceolate-attenuate, averaging 15—20 cm. long, 5—6 cm. broad; *upper surface* flat to slightly canaliculate, grey-green with reddish tinge, obscurely lineate, the nerves 1—2 mm. apart; *lower surface* rounded, similar to upper surface; *margins* with slight cartilaginous edge armed with pale teeth 1—2 mm. long, 5—8 mm. apart.

Inflorescence simple or 1—2-branched, 35—50 cm. high.

Peduncle flattened and 10—14 mm. broad at base; when simple, clothed with a few sterile-bracts that are ovate-acute, 15 mm. long, 7 mm. broad, thin, scarious, brittle, very white, many-nerved.

Racemes cylindric-conical, 10—12 cm. long, 6 cm. diam., the apex a tuft of dry white bracts, apical buds denser and almost hidden by their white bracts, laxer downwards, open flowers nutant to subpendulous.

Bracts usually longer than the pedicels, ovate-acute, thin, scarious, brittle, very white, about 9-nerved, usually deflexed near base, about 15 mm. long, 7—8 mm. broad.

Pedicels 12—16 mm. long.

Perianth pale-scarlet, 25—30 mm. long, cylindric, slightly curved-clavate, basally obtuse, 6 mm. diam. across the ovary, slightly constricted above the ovary, thence slightly decurved and enlarging to an open mouth; *outer segments* free for two-thirds their length, thinner and paler at the margins, obscurely 5-nerved, apices subacute, spreading; *inner segments* broader than the outer, with prominent scarlet keel, the apices more obtuse and more spreading than the outer.

Filaments pale-rose, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 1—2 mm.

Stigma at length exserted 2—3 mm. *Ovary* dark olive-green, 6 mm. long, 2.5 mm. diam., obtuse at apex (Plates XX, XXI.)

Fianarantsoa Province: Betsileo, Ikalamavony (north-west of Fianarantsoa) 800 m. alt., form with broad leaves, Perrier 13121! (P); form with leaves averaging 30 cm. long, 5 cm. broad, Perrier 13121 *bis*! (P); Mont Amboloandro near Zazafotsy, alt. 800 m., rocky places with xerophytes, leaves 16—18 cm. long, 5—7 cm. broad, March 1912, Perrier 11026! (P); ex Ivohipolaka, cult. Johannesburg, 9 March 1952, Reynolds 6208 (PRE).

Distribution: In considerable numbers on semi-denuded rocks and pavements at km. 22, 32, 47, 49 and 52 north-east of Zazafotsy on the road to Ambalavao, alt. 660 m.—720 m.; at foot of the southern end of the Andringitra range 24 km. north of Ivohibe, 660 m.; north end of the Andringitra near Mahasoa; Ikalamavony; Ivohipolaka.

In Johannesburg plants flower in March.

A. deltoideodonta Baker var. *brevifolia* H. Perr. in *Mém. Soc. Linn. Norm.* (*l.c.*) 24, et *Fl. Madag.* (*l.c.*) 86.

Tulear Province. Betioky District: Denuded sandstones near Benenitra (Onilahy Valley), *c.* 100 m. alt., July 1919, Perrier 12740! type (P).

Perrier states that his var. *brevifolia* has "leaves at least 50 mm. broad," but his type (Perrier 12740) comprises two very small plants with *leaves* up to 10 cm. long, but only 2.5 cm. broad, with *marginal teeth* 1.5—2 mm. long and 2—5 mm. apart. The *inflorescence* is simple and 30 cm. tall, with *raceme* cylindric, 6—10 cm. long, sublaxly flowered. *Bracts* are thin, white, 10 mm. long, 4 mm. broad. *Pedicels* about 12 mm. long. *Perianth* 22 mm. long (dry)—possibly 25 mm. or more when alive. (Plate XXII.)

This material in rosettes, leaves and marginal teeth, bears a striking resemblance to Baron 5181 —*A. deltoideodonta* Bak.—but in the latter the inflorescence is 60 cm. tall with racemes 18 cm. long. ' Perrier also has a note, "In the same locality (i.e. Benenitra) I have found a different form (Perrier 13496) with still broader leaves, 7 cm. and more, with the surface covered with scattered small white spots and with bracts that are shorter than half the length of the pedicels."

Perrier 13496! has a leaf 25 cm. long, 10 cm. broad, which closely resembles that of *A. imalotensis* (described below), but the inflorescence characters, raceme 15—18 cm. long and narrowing to an acute apex, are nearer the typical form of *A. deltoideodonta*. Perrier 13496 is hardly a form of the var. *brevifolia*, and may represent an undescribed species.

The var. *brevifolia*, it seems, closely resembles typical *A. deltoideodonta* in rosettes, leaves and marginal teeth, but differs in having a lower inflorescence (30 cm. against 60 cm.) and shorter denser racemes (6—10 cm. long against 18 cm. long).

A. imalotensis Reynolds Spec. nov.—*A. deltoideodonta* Baker var. *contigua* H. Perrier in *Mém. Soc. Linn. Norm.* (*l.c.*) 25, et *Fl. Madag.* (*l.c.*) 86.

Description based on flowering plants near Ranohira and Benenitra:

Plants growing singly or in small groups, acaulescent or with short procumbent stem up to 10 —20 cm. long, 3 cm. diam.

PLATE XXII. *A. deltoideodonta* Bak. var. *brevifolia* H. Perr.
Photograph of the type, Perrier 12740, in Paris.
—*Photo by courtesy of Dr. R. A. Dyer, Chief, Division of Botany, Pretoria.*

PLATE XXIII. *Aloe imalotensis* Reynolds.
On sandstone, 14 km. south-west of Ranohira, Ihosy Dist., Fianarantsoa Prov., Madagascar, 600 m. alt., 12 July 1955. Height 65 cm.

PLATE XXIV. *Aloe imalotensis* Reynolds.
On sandstone, 21 km. west of Benenitra, Betioky District, Tulear Province, Madagascar, 270 m. alt., 10 July 1955. Height 60 cm.
Flowers 1/1 from a plant 14 km. south-west of Ranohira.

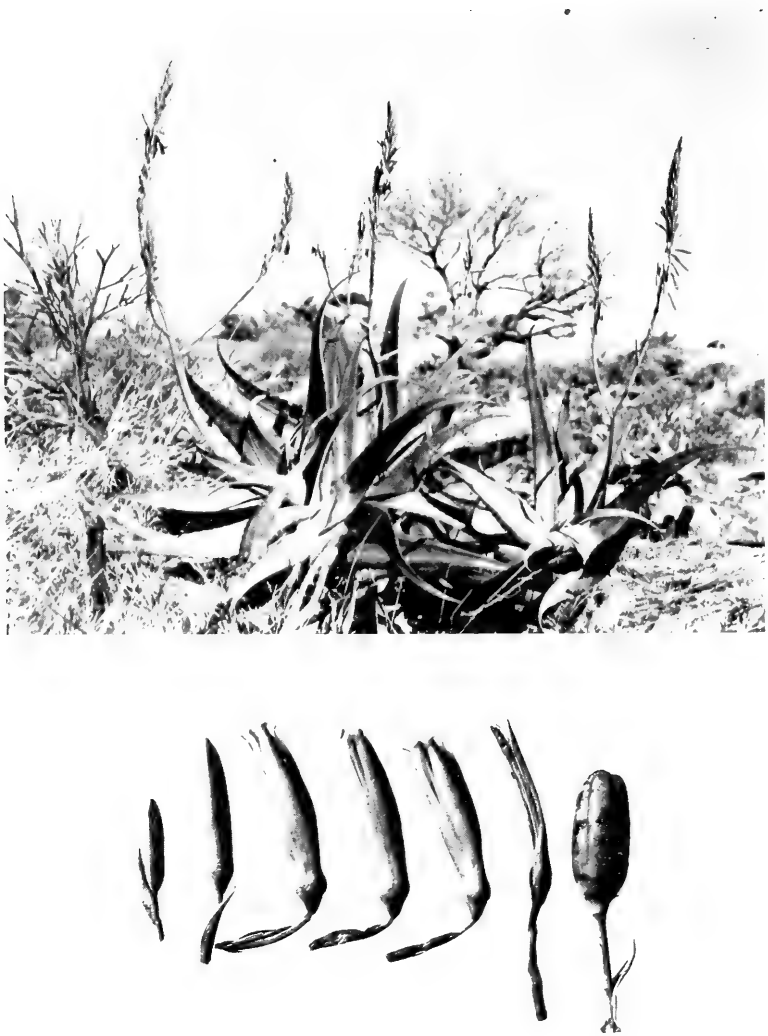

PLATE XXV. *Aloe intermedia* (H. Perr.) Reynolds.
On rocks 52 km. north-east of Zazafotsy, Ihosy District, Fianarantsoa Province, Madagascar, 960 m. alt., 23 June 1955. Height 80 cm.
Flowers 1/1 from bud to post-pollination stage.

Leaves 20—24, densely rosulate, compactly arcuate-ascending, broadly ovate-acute, up to 30 cm. long, 12—15 cm. broad, very fleshy; both *surfaces* dull bluish-green with reddish tinge, flat to slightly convex, obscurely lineate, without spots or markings; *margins* with 1 mm.-broad pink to reddish cartilaginous border armed with deltoid or obtuse pink teeth 1—1.5 mm. long, and varying from 1—4 mm. apart to sometimes contiguous.

Sap dries yellow.

Inflorescence a 2—4-branched erect or suberect panicle 50—65 cm. high, 2—3 simultaneously.

Peduncle basally plano-convex and 20 mm. broad, terete upwards, 2—4-branched from about the middle, the lowest branch subtended at base by a broadly ovate-acute bract which is thin, scarious, white, many-nerved.

Racemes subdensely flowered, cylindric slightly acuminate, 10—20 cm. long (15 cm. the average), 7 cm. diam., erect, buds sub-erect and grey-green tipped, older buds spreading, open flowers pendulous.

Bracts ovate-acute, thin, scarious, white, 7—10 mm. long, 3—4 mm. broad, 5-nerved, usually less than half the length of the pedicel.

Pedicels the lowest 15—18 mm. long.

Perianth cylindric slightly curved, coral-red, 30—34 mm. long, basally obtuse, 6 mm. diam. across the ovary, very slightly constricted above the ovary thence slightly decurved and slightly enlarging towards the throat: *outer segments* free almost to base, obscurely 3—5-nerved, the apices subacute and slightly spreading; *inner segments* broader than the outer, with broad white border, keeled throughout, the apices more obtuse and more spreading than the outer.

Filaments pale lemon, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 1—2 mm.

Style lemon, with *stigma* at length exserted 2 mm.

Ovary pale green, 6 mm. long, 2.5 mm. diam., the apex truncate. (Plates XXIII—XXIV.)

Fianarantsoa Province. Ihosy District: On Triassic shale of the Imaloto Valley near Ranohira, 600 m. alt., July 1910, Perrier 11022! type (P); 14 km. south-west of Ranohira, *c.* 22° 37′ S., 45° 21′ E., *c.* 600 m. alt., 12 July 1955, Reynolds 7897 (TAN, P, K, PRE).

Tulear Province. Denuded sandstone, about 600 m. alt., Mont Ambohibe, Manombo du Sud, May 1910, Perrier 11019! (P): 21 km. west of Benenitra, *c.* 23° 26′ S., 44° 54′ E., *c.* 270 m. alt., 10 July 1955, Reynolds 7864 (TAN, P, K, PRE).

A. imalotensis is named after the area where plants occur in the largest numbers, namely, in the valley of the Imaloto River from near Ranohira

in the north (600 m.) to the Onilahy valley near Benenitra (270 m.) in the south.

These plants vary in too many characters to constitute a variety of *A. deltoideodonta* Bak. and they well merit specific rank.

Large numbers of *A. imalotensis* occur 14 km. and 19 km. east-north-east of Ranohira (770 m. alt.) In this area plants were found with short obtuse leaf marginal teeth that varied from contiguous to 1—4 mm. apart, hence Perrier's *forma longifolia* and *forma latifolia* are regarded as forms of this species.

In leaf characters *A. imalotensis* is closely allied to *A. Viguieri* H. Perr. near Tulear, but in *A. Viguieri* the inflorescence is simple, with very lax racemes and flowers only 22 mm. long.

In the Isalo range near Ranohira, rosettes of leaves with pink edge bear a striking resemblance to those of the South African species. *A. striata* Haw., but the latter has no marginal teeth, and a different inflorescence and flowers.

A. intermedia (H. Perr.) Reynolds. Spec. nov.—*A. deltoideodonta* Bak. var. *intermedia* H. Perr. in *Mém. Soc. Linn. Norm.* (*l.c.*) 24, et *Fl. Madag.* (*l.c.*) 86.

Plants of shrubby growth with erect, divergent, or procumbent creeping and rooting stems up to 1 m. long and 3 cm. diam., the apical 20 cm. or more subdensely foliate, with old dried leaf remains persistent.

Leaves about 20—26, rosulate, basally sheathing, lanceolate-attenuate, up to 25—30 cm. long in old specimens, 5—6 cm. broad; *upper surface* dull green with reddish tinge, without spots or markings, flat to slightly canaliculate; *lower surface* slightly rounded, dull green; *margins* armed with reddish-brown teeth that are paler at the tips and deltoid, 3—4 mm. long, 10 mm. apart in upper half, smaller and closer lower down.

Inflorescence about 60 cm. tall.

Peduncle basally plano-convex and 10 mm. broad, terete upwards, 2—3-branched from the middle or lower.

Racemes cylindric-acuminate, 10—15 cm. long, the apical buds denser suberect and hidden by their imbricate bracts, slightly laxer downwards with the open flowers nutant to subpendulous.

Bracts clasping the pedicel, lanceolate-acute, thin, subscarious, 12 mm. long, 3—5-nerved.

Pedicels 15 mm. long, the colour of the perianth, 20 mm. in the fruit.

Perianth reddish-scarlet, averaging 28 mm. long, obconic at base, 5 mm. diam. across the ovary, constricted to 4 mm. above the ovary, thence slightly decurved and enlarging to the throat; *outer segments* free for 11 mm., obscurely 3-nerved, the apices subacute and slightly spreading;

inner segments free but dorsally adnate to the outer to beyond the middle, broader than the outer and with more obtuse more spreading apices.

Filaments filiform-flattened, the 3 inner narrower and lengthening before the 3 outer with their *anthers* exserted 0—1 mm.

Stigma at length exserted 1 mm.

Ovary olive-green, 4.5 mm. long, 2 mm. diam., truncate at apex. (Plate XXV.)

Tulear Province: Between Itrongay and Benenitra west of Botroka, (Onilahy basin), *c.* 600 m. alt., Perrier 12690! type (P).

Fianarantsoa Province: South Betsileo, Ihosy District, on flat rocks, 52 km. north-east of Zazafotsy, *c.* 21° 57′ S., 46° 26′ E., *c.* 960 m. alt., 23 June 1955, Reynolds 7741 (TAN, K, PRE); same locality, 12 July 1955, Reynolds 7885 (TAN, K, PRE).

I could not reach Perrier's locality between Itrongay and Benenitra, but I found this species in considerable numbers about midway between Ambalavao and Zazafotsy in south Betsileo, on flat rocks 52 km. north-east of Zazafotsy. Large numbers occur on rocks 1—4 km. north of Zazafotsy, also between Zazafotsy and Ihosy, and east and south of Ihosy. A small form was found on the edge of the Horombe plateau at 1000 m. alt., about 40 km. south of Ihosy.

A. intermedia is a plant of shrubby growth with erect, divergent, or creeping and rooting procumbent stems up to 1 m. long in old specimens. It is nearest allied to *A. acutissima* H. Perr. in shrubby growth, racemes and shape of flowers, but the latter is of taller more erect growth, with more spreading comparatively narrower and longer leaves, smaller marginal teeth, and other differences.

Our third new species belongs to a very different group, namely *A. capitata* Bak. and varieties. This group is separated from all other groups of Malagasy Aloes by having globose to corymbose densely capitate racemes in which the uppermost pedicels are always much longer than the lowest ones.

On 17 June 1955, Mr. Descoings and I found many plants of a species high up on north-eastern slopes of Mont Ibity, near the top of a spur known locally as Koboui. This locality is west of the Manandona River about 5 km. above Ambolohiponana Village, at about 1600 m. alt., and *c.* 20° 05′ S., 47° 01′ E.

In *Mém. Soc. Linn. Norm.* (*l.c.*) 38, Perrier had described *A. capitata* Bak. var. *trachyticola* from mountains between the Ivato and Mania Rivers in the northern part of Fianarantsoa Province, (Perrier 11009), and from the top of Famoizankova, north of Antsirabe, at about 2200 m.

alt., in the southern part of Tananarive Province (Perrier 11100). Mont Ibity lies between these two localities.

I have not seen Perrier 11009, but I have recently examined Perrier 11100 and found that the Famoizankova and Mont Ibity plants are unquestionably one and the same species. But they differ in too many essential characters to constitute a variety of *A. capitata*, and they well merit distinct specific rank.

Leaves are distichous in young plants, becoming spirally twisted to rosulate with age; they are much shorter and narrower and are not of the kind associated with *A. capitata* and varieties.

The inflorescence is not branched.

The raceme is somewhat similar to *A. capitata* with the lowest pedicels much shorter than the uppermost ones, but is much smaller, and the lowest flowers open first, the apical ones last. In *A. capitata* the uppermost flowers open first.

The perianth is thick, fleshy, cylindric-trigonous, curved, and up to 35 mm. long with the anthers scarcely exserted, and is in all ways distinct from the campanulate flowers with 10 mm. exserted anthers of *A. capitata* and varieties.

The species can now be figured and more fully described, with Perrier's epithet retained:

A. trachyticola (H. Perr.) Reynolds, spec. nov.—*A. capitata* Bak. var. *trachyticola* H. Perr. in *Mém. Soc. Linn. Norm.* (*l.c.*) 38, et *Fl. Madag.* (*l.c.*) 103.

Plants solitary, mostly acaulous, but sometimes developing a procumbent stem.

Leaves 6—10 when young and distichous, up to 14 when spirally twisted to subrosulate, 10—15 cm. long, 3—4 cm. broad, the apex obtusely rounded and shortly-dentate; *upper surface* bluish-grey with reddish tinge, glabrous, flat to slightly concave; *lower surface* convex, similar in colour to upper surface; *margins* armed with reddish-brown teeth that are deltoid, pungent, 1—1.5 mm. long, 3—5 mm. apart.

Inflorescence simple, 65—90 cm. high.

Peduncle brown with a bloom, with a few sterile-bracts in upper half, the lowest ovate-cuspidate, 10 mm. long, 18 mm. broad, 5—7-nerved, smaller upwards.

Raceme densely capitate, the pedicellate part 2—3 cm. long, 7—8 cm. diam., the apex a tuft of dried bracts, the lowest flowers opening first, the uppermost last, the apical buds nutant, the lowest flowers pointing downwards and closely grouped around the axis.

Bracts ovate-acute, thin, 10 mm. long, 6 mm. broad at the middle, 5—7-nerved.

PLATE XXVI. *Aloe trachyticola* (H. Perr.) Reynolds.
Plant on a north-eastern spur of Mont Ibity, Tananarive Province, c. 20° 05′ S., 47° 01′ E., c. 1,600 m. alt. Height 75 cm.

Fig. 1.

Fig. 2.

Fig. 1.

PLATE XXVII. *A. trachyticola* (H. Perr.) Reynolds.

Fig. 1. Upper portion of leaf 1/1 (upper surface).
Fig. 2. Flowers 1/1 from bud to post-pollination stage.

Pedicels the lowest 3—5 mm. long, gradually lengthening upwards, with the uppermost 15—20 mm. long.

Perianth red, up to 35 mm. long, cylindric-trigonous, slightly curved; *outer segments* free almost to base; *inner segments* broader than the outer, with 3 crowded nerves forming a prominent red keel, the apices more obtuse than the outer.

Filaments yellowish, the 3 inner narrower and lengthening before the 3 outer with their *anthers* in turn exserted 1—2 mm.

Stigma at length exserted 2—3 mm.

Ovary olive-brown, 7 mm. long, 3.5 mm. diam., tapering into the style. (Plates XXVI, XXVII.)

Tananarive Province: On trachytes, on the top of Famoizankova, north of Antsirabe, about 2,200 m. alt., March 1912, Perrier 11000! type (P); on a north-eastern spur of Mont Ibity, 1,600 m. alt., *c.* 20° 05′ S., 47° 01′ E., 17 June 1955, Reynolds 7688 (TAN), 7690 (PRE).

Fianarantsoa Province. On quartzites, mountains between the Ivato and Mania Rivers, about 1,400 m. alt., Perrier 11009 (P) —with slightly broader and shorter leaves and larger marginal teeth.

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SOME MARINE ALGAE FROM XAI-XAI[1]

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(With Plates XXVIII—XXXIII)

INTRODUCTION

The algae listed in this paper were collected in July 1956.

Xai-Xai is a coastal village about nine miles from the small town Vila João in Moçambique. It is situated approximately ten miles in a north-eastward direction from the mouth of the Limpopo River and is at about 25° S. latitude. It thus falls within the general region of influence of the warm Agulhas Current.

The coast at Xai-Xai consists of sand dunes which slope down to low water level of spring tides or to a somewhat higher level. This low sandy level is fronted by a rampart of rock which forms a reef running more or less parallel to the sea. From an ecological point of view this reef provides three sets of habitats: (*a*) the landward side, (*b*) the reef top and (*c*) the seaward cliff. It was not possible to make a detailed ecological study but a few general comments are added.

The landward side.—The reef rises unevenly on the landward side providing a variety of habitats; more or less flat ledges, rock pools, boulders, and vertical or more or less vertical faces subject to varying degrees of illumination. The outstanding condition relating to this part of the reef as a whole is that it is protected from the impact of violent wave action. A considerable range of species occurs on the landward side among which may be named *Galaxaura corymbifera*, *Martensia elegans*, *Peyssonelia capensis* and *Pocockiella variegata*.

[1]Sometimes written Chi-Chi (pronounced Shy-Shy).

The reef platform.—This slopes gently seaward and is characterised by numerous large shallow pools. In places on the landward side of the platform there is a girdle, usually narrow, of the oyster *Gryphaea cucullata.* Kalk (1954) showed that on the island of Inhaca this animal occurs from about mean high water of neap tides to about half-way between that level and the highest low water of neap tides. If we accept this intertidal range for *Gryphaea* at Xai-Xai, then the landward edge of the reef platform is in general at about high water level of neap tides. The seaward edge of the platform merges into the upper levels of the seaward side of the reef which is at about low water level of spring tides.

In general the algae occur from the lower limit of the *Gryphaea* girdle downwards, i.e. from about midway between high and low water neap tide levels to low water spring tide levels. This may seem to be a restricted range but the extent of algal growth on the reef platform is considerable due to the gentle slope of the platform, the numerous tide pools and the not inappreciable tidal range. In a northward direction on the east coast of southern Africa the extreme tidal range rises to 11·9 ft. (3·3 m.) in Delagoa Bay which is about twice the range at Durban (Kalk 1954). If we accept the levels and figures given by Kalk (1954) as applying to Xai-Xai, the algae on the reef platform occur from a little above mean tidal level to about mean low water spring tide level. The mid level of the platform corresponds roughly to or somewhat above the level of average low tide (A.L.T.).

Just below and at the lower limit of the *Gryphaea* girdle a more or less dense growth of a small *Enteromorpha* is found. Also at this level but only on firm substrata *Ulva rigida* occurs. *Ulva rigida* extends seawards from this level. Below the *Enteromorpha—Ulva* level plants of a variety of *Cystoseira myrica* are common in shallow pools and around the pool margins. At about A.L.T. level, patches of the brown-coloured zoanthid *Palythoa nelliae* are found and where these patches occur algae are practically excluded. In a variety of places from about this level downwards are to be found patches of *Jania intermedia.* More usually below A.L.T. level occur: *Caulerpa scapelliformis* in algal turf, patches of *Caulerpa racemosa*, and plants of *Sargassum elegans.* Occurring as a dominant in places towards the seawards edge is *Cheilosporum cultratum. Hormophysa triquetra*, *Padina commersonii* and *Zonaria subarticulata* are more characteristic of pools and shallow water. Dense growths of the Angiosperm *Cymodocea ciliata* occur in deep pools near the seaward margin of the reef platform.

The seaward cliff.—The seaward side of the reef is steeper than the landward side and in places is broken by deep clefts leading up into the

ɔf the waves is considerable and collecting
; are prominent species of the upper parts
elegans, *Rhodymenia natalensis*, *Gracilaria*

Γ OF SPECIES

ɜ is the same as that used in a recent paper
ɜ Algae of Inhaca Island and the Inhaca
d (1952) for siphononous chlorophyceae, of
hlorophyceae (1935) and of Kylin for the
e Florideae (1937).
› literature are given for each species dealt
s listed in the first paper on Inhaca Algae
ɜ referred to in the text as "Inhaca Algae".
page reference is given to the earlier paper
e will be found. Where a reference has not
ıin brackets. Books are referred to by their
, the necessary details relating to the journal
ılished are given except for such well-known
rgesen on the marine algae of Mauritius and
erpa where an abbreviated title for the mono-
ces will be found under "Literature cited".
ɔution of species on the coasts of the Union of
ement is made to the contrary, it is implied
d the species for the range indicated.

HLOROPHYCEAE

ULOTRICHALES

Ulva rigida C. Ag.

See "Inhaca Algae", p. 165

This species is widely distributed on the reef platform extending landward to the lower limits of the oyster (*Gryphaea cucullata*) girdle.

CLADOPHORALES

Chaetomorpha antennina (Bory) Kütz.

Sub-nom *Conferva antennina*.

(Bory: *Voyage dans les quatre principales Îles des Mers d'Afrique*, vol. 2, p. 161, 1804.)

ACKNOWLEDGEMENT

Miss D. G. Winkler is indebted to the South African Council for Scientific and Industrial Research for a Student Bursary which enabled her to carry out the work described in her paper "Bydrae tot die Kennis van Microplerum Schwant.—Subgenus Aethephyllum (N.E. Br.), Schwant," which appeared in the JOURNAL OF SOUTH AFRICAN BOTANY, Vol. XXIII, Pt. 1, Jan. 1957.

Sub-nom *Chaetomorpha antennina.*
Kütz: *Species Algarum*, p. 379.
Vickers: *Phycologia Barbadensis*, Part 1, p. 19, Pl. 8.
Börgesen: *Marine Algae of the Danish West Indies*[2], Part 1, p. 16, Figs. 4—5.
Börgesen: *Mauritius Algae*, Part 1, p. 37.

This alga was previously known in the Union as *Chaetomorpha media* (C. Ag.) Kütz. and was listed under this name by Levring (1938). Börgesen (1940) gives some account of the variation in length of the long basal cell of filaments of *C. antennina* and discusses the relationship of material named *C. antennina* and *C. media*. Börgesen recognises a range of variation in the length of the basal cell extending from 3—4 mm. at one extreme to 15—16 mm. at the other. (Börgesen, 1940, pp. 35—39). A range of 4·7 mm. to 7·2 mm. long was recorded for the basal cell of plants collected at Xai-Xai.

On the parts of the reef examined this alga occurred as an occasional species.

In the Union this species grows on the Natal coast.

Chaetomorpha crassa (Ag.) Kütz.
Agardh, C. A.: *Systema Algarum*, p. 99.
Kütz.: *Species Algarum*, p. 379.

This plant occurs as an epiphyte on algae of the lower intertidal levels.

Chaetomorpha crassa is known from the east coast of the Cape Province where I have collected it at East London and at Dwesa (about 70 miles north of East London). I have material of this species collected by Dr. Kolbe from Qolora (Isaac 499) which is about forty miles north of East London.

SIPHONALES

Caulerpa filiformis (Suhr) Hering.
Sub-nom *Amphibolis filiformis.*
(Suhr: *Flora*, Vol. 17, p. 737, Pl. 2, Fig. 13.)
Sub-nom *Caulerpa filiformis.*
Hering: *Ann. Mag. Nat. Hist.*, Vol. 8, p. 91.
Papenfuss: *Bot. Notiser*, 1940, p. 201, Fig. 2.
Sub-nom *Caulerpa ligulata* (Harv. ms.)
Agardh, J. G.: *Till. Alg. Syst.*, 1, p. 10.
Sub-nom *Caulerpa flagelliformis* f. *ligulata.*

[2]Henceforth referred to as Marine Algae, D.W.I.

Weber v. Bosse: *Des Caulerpes*, p. 274, Pl. 24, Fig. 7.

For many years this plant was known in the Union as *Caulerpa ligulata*. The nomenclature and identity of the species has been discussed by Papenfuss (1940). According to Papenfuss *Caulerpa filiformis* corresponds in part to *Caulerpa flagelliformis* f. *ligulata* and in part to f. *typica* as defined by Weber van Bosse. The Southern African material corresponds well with f. *ligulata* but I have not observed plants corresponding to f. *typica*. For this reason and because of its marked difference from f. *ligulata* (cf. Weber van Bosse, 1898, Plate 24, Fig. 8 and 9) f. *typica* has been excluded above in listing under synonomy.

In addition to occurring at Xai-Xai this species was collected at Quissico (Zavala) about twenty miles north of Xai-Xai by J. Gomes Pedro and named by me. Herbarium specimens of this and of a few other algal species collected from Quissico by Gomes Pedro are housed in the Herbário de Moçambique in the Centro de Investigação Cientifica Algodoeira at Lourenço Marques. Subsequent references to Quissico distribution records refer to plants of this collection which I determined.

Caulerpa filiformis has a wide distribution on South African coasts especially for a species of this genus. It extends from the east coast of the Cape Peninsula to the northern Natal Coast. It is locally abundant in False Bay (Cape Peninsula) and also at Tergniet near Mossel Bay and is a common species in suitable habitats on the east coast of the Union. It grows rooted in sand in moderately sheltered waters (e.g., St. James in False Bay) and it also occurs attached to rock in moderately rough seas (e.g., locally at Port Elizabeth).

As far as I have been able to ascertain, the Xai-Xai and Quissico records are the first clear records of the existence of this species outside the Union of South Africa. Börgesen (1940) records a closely related form (*C. mauritiana* Börgs) from Mauritius.

Caulerpa mexicana Sonder ex Kütz.

Kützing: *Species Algarum*, p. 496.

Sub-nom *Caulerpa pinnata*.

Weber van Bosse: *Des Caulerpes*, p. 289, Pl. 24, Figs. 1—3.

The synonomy and identity of this species have been discussed by Papenfuss (1956) who regards the name *Caulerpa mexicana* as synonymous with inter alia *C. crassifolia* and *C. taxifolia* which names should be superseded. Eubank had earlier (1946) suggested that *C. taxifolia* and *C. crassifolia* might be conspecific and pointed out that the name *C. taxifolia* antedated *C. crassifolia*. South African material of the plant was referred to by Isaac (1956a) under the name *C. taxifolia* and Gold Coast plants were called *C. crassifolia* by Dickinson and Foote (1951).

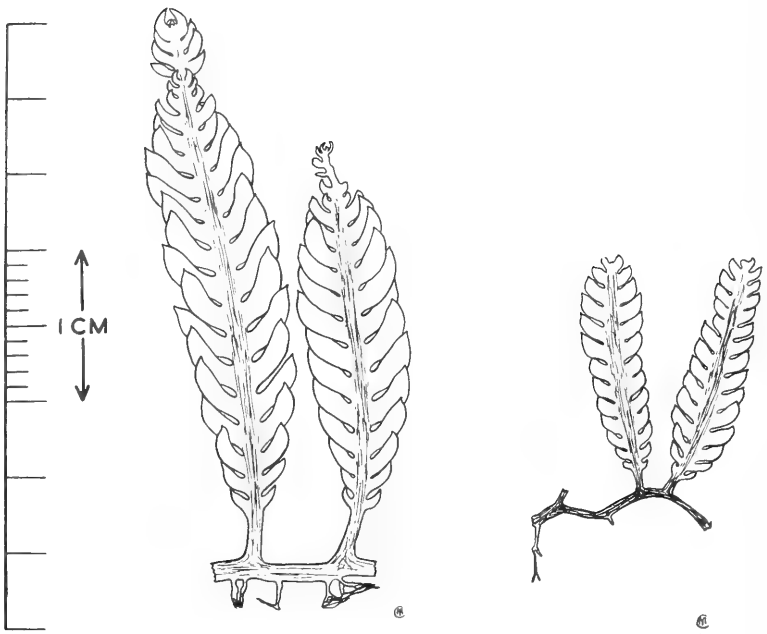


FIG. 1.—*Caulerpa mexicana* Sonder ex Kütz. Left, B.247 from Isipingo. Right, B.346 from Xai-Xai.

Plants of *Caulerpa mexicana* collected at Xai-Xai were of small size (Fig. 1 right), the fronds being less than 2 cm. high.

This species was collected by Pocock and Papenfuss at Durban and at Umhlanga Rocks on the Natal coast (Papenfuss, 1956). These plants were of similar dimensions to those collected at Xai-Xai. Material was also collected and sent to me from Isipingo (near Durban) by Mr. G. M. Thomson. Fronds of the Isipingo plants (Fig. 1, left) attained to heights of somewhat over twice the height of the Xai-Xai plants. The Isipingo material was examined by Miss Dickinson of Kew who was satisfied that it was the same taxon as the Gold Coast plant called *Caulerpa crassifolia*.

The plants collected at Xai-Xai and at Isipingo had simple unbranched fronds. Weber van Bosse's figures (sub-nom *Caulerpa pinnata*) depict branched fronds, but Eubank (1946) shows both branched and unbranched fronds.

Caulerpa racemosa (Forssk.) W. v. B.

This is a notoriously variable species and a large number of varieties and forms have been described. Even so there are frequent difficulties

in delimitation so that, for example in Börgesen's writings, such qualifications as "near to forma", "shows some likeness to var.", or "most like" are found (Börgesen, 1913, 1946). One difficulty which has been experienced by me and by others who have worked with these plants is that different parts of a single plant may show characteristics belonging to different taxa that have been delimited as distinct varieties, forms and even species.

Some of the material collected at Xai-Xai was to a greater or lesser extent transitional between delimited varieties and plants could be found showing characteristics of more than one taxon. Taken as a whole, however, the material examined could be grouped around two varieties:

var **uvifera** (Turn.) W. v. B.

Sub-nom *Fucus uvifer.*

Turner: *Fuci*, Vol. 4, p. 82, Pl. 230.

Weber van Bosse: *Des Caulerpes*, p. 362, Pl. 33, Fig. 6, 7, 23.

Börgesen: *Marine Algae*, D.W.I., Part 1, Fig. 117 and 118.

var. **turbinata** (J. Ag.) Eubank.

Sub-nom *Caulerpa clavifera* var. *turbinata.*

(J. G. Agardh: Novae species Algarum quas in itinere ad oras maris rubri., p. 173.)

Sub-nom *Caulerpa racemosa* var. *turbinata.*

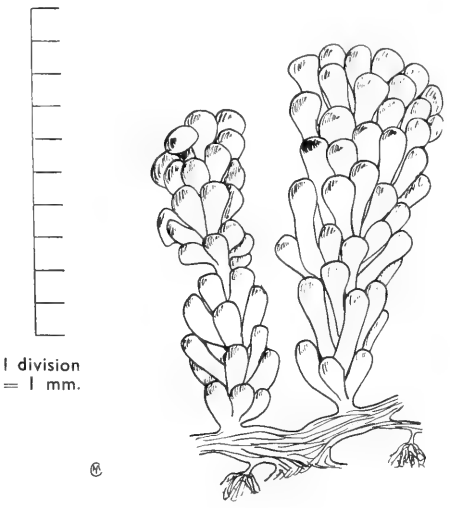


FIG. 2.—*Caulerpa racemosa* (Forssk.) W.v.B. var. *uvifera* (Turn) W.v.B. (Material: B.350.)

FIG. 3.—*Caulerpa racemosa* (Forssk.) W.v.B. var. *turbinata* (J. Ag.) Eubank. (Material: B.351.)

Eubank: *Univ. Calif. Pubs. Bot.*, Vol. 18, p. 420, Fig. 2, O—Q.
Sub-nom *Caulerpa racemosa* var. *chemnitzia.*

Weber van Bosse: *Des Caulerpes*, p. 370, Pl. 31, Figs. 5—8.

Xai-Xai plants of these varieties are depicted in Fig. 2 and 3. Plants of the var. *turbinata* were found in which some pinnae showed a greater or lesser approach to the pinna character depicted for certain forms of var. *peltata* (Lamx) Eubank (Eubank 1946, p. 421).

Most of the material described above occurred in dense moderately sized mats. Plants showing a closer approach to var. *peltata* were characteristically found beneath overhanging rocks.

Caulerpa racemosa var. *turbinata* has been recorded from the east coast of the Union by Stephenson (1947) under the name of var. *chemnitzia.* Eubank (1946) pointed out that var. *turbinata* and var. *chemnitzia* are synonymous, and that the name var. *turbinata* has priority.

Caulerpa scalpelliformis (R. Br.) C. Ag.

See Inhaca Algae, p. 168. Fig. 5.

Both var. *denticulata* (Decaisne) W. v. B. and var. *intermedia* W. v. B. were collected.

The species was fairly common, growing among other plants at about mid-level of the reef platform and a number of plants were observed in rock pools on the landward side of the reef,

The rock pool plants showed a luxuriant growth, most of the specimens collected being well differentiated var. *denticulata.*

Chlorodesmis hildebrandtii A. and E. S. Gepp.

A. and E. S. Gepp: *The Codiaceae of the Siboga Expedition*, p. 16, Pl. 8, Fig. 74 and 75.

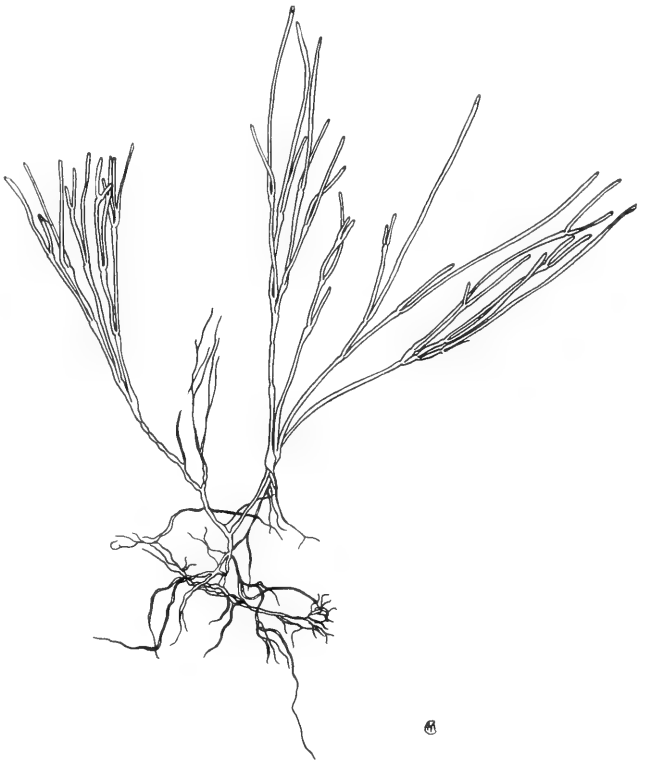


FIG. 4.—*Chlorodesmis hildebrandtii* A. and E. S. Gepp. (B.348) × 2.

The general habit of this species is illustrated in Fig. 4. The plants collected are perhaps somewhat small in size, growing to a height of about 4 cms. whereas A. and E. S. Gepp give a height of about 6 cms. The plants grow in dense, flexible tufts which have a beautiful silky green sheen. Details of structure are shown in Fig. 5 which illustrates the characteristic constrictions of the filaments placed evenly above the dichotomies of the branches. This characteristic distinguishes the species from *C. comosa* in which the constrictions are unevenly placed above the branch dichotomies.

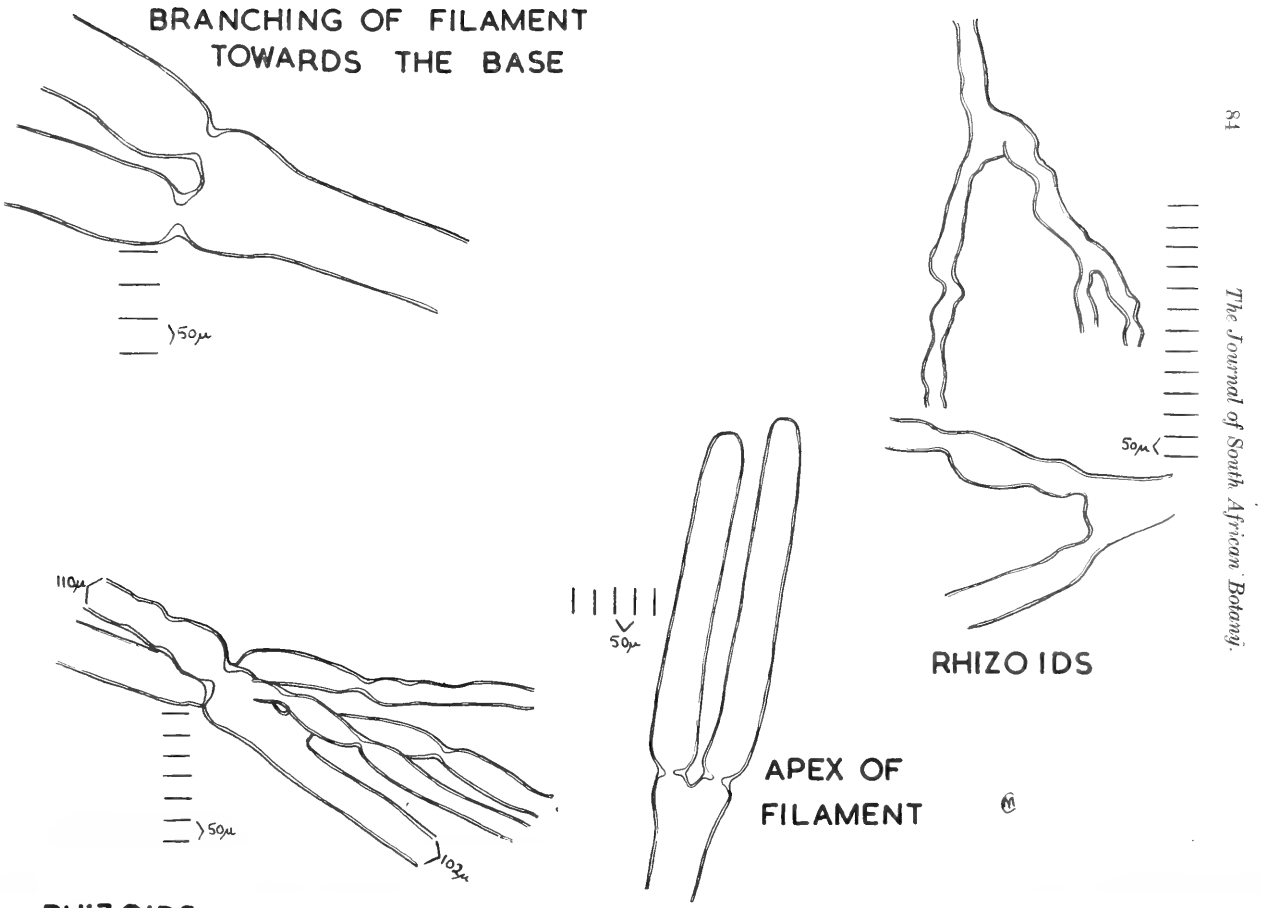


FIG. 5.—Structure of filaments and rhizoids of *Chlorodesmis hildebrandtii* A. and E. S. Gepp.

Halimeda cuneata Hering.

See "Inhaca Algae", p. 170, Pl. 36.

Well-developed plants of this species were collected. This plant also occurs at Quissico.

Udotea orientalis A. and E. S. Gepp.

See "Inhaca Algae", p. 171, Pl. 37.

The plants collected were up to about 5 cms. high.

SIPHONOCLADALES

Chamaedoris delphinii (Hariot) Feldm. et Börgs.

See "Inhaca Algae", p. 172, Pl. 38.

Valonia macrophysa Kütz.

See "Inhaca Algae", p. 173.

Valoniopsis pachynema (Mart.) Börgs.

Sub-nom. *Bryopsis pachynema.*

Martens: *Die Tange*, p. 24, Pl. 4, Fig. 2.

Sub-nom. *Valoniopsis pachynema.*

Börgesen: Marine Algae from the Northern Arabian Sea, p. 10, Fig. 1 and 2.

This species forms dense mats of green, branching filaments. The mats may be a few centimetres high and mats with diameters of 5 to 7 cms. were collected (Plate XXVIII a). When fresh, the plants are rigid due

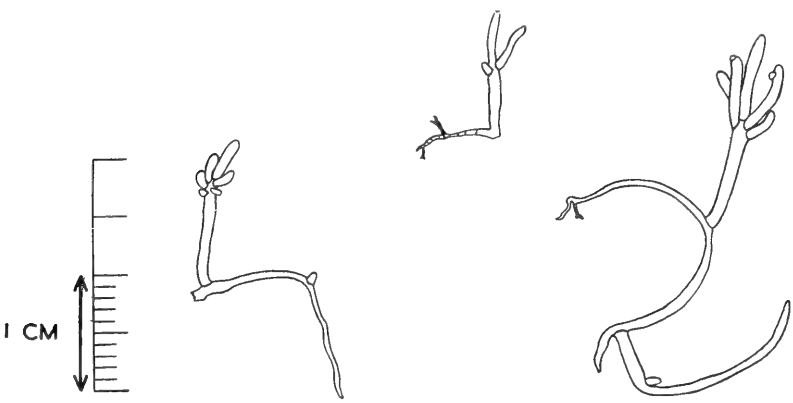


FIG. 6.—Portions of *Valoniopsis pachynema* (Mart) Börgs (B.331) showing details of branching.

to the turgidity of the filaments but in preservative the plants become flaccid.

The manner of branching is variable and a range of variations has been described by Börgesen. Two general characteristics may be noted: (*a*) the point at which a branch has grown out is marked by a cross wall; (*b*) branching is basipetal and hence the oldest and largest branch of a series is the most distally placed (Fig. 6). The mats are attached to the substratum by rhizoidal branches which bear small haptera. These rhizoidal branches have numerous cross walls which occur without any

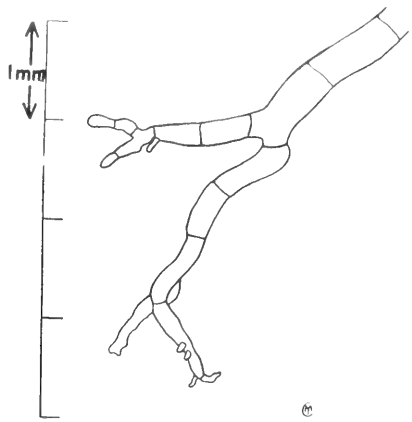


FIG. 7.—Part of rhizoidal system of *Valoniopsis pachynema* (Mart) Börgs (B.331) more highly magnified.

relationship to branching (Fig. 7). In the non-rhizoidal filaments cross walls occur only in relation to branches and the cutting off of small hemispherical masses at the tips of filaments from which apical segments new branches will arise. In material preserved in formalin-sea water these small cut off segments are conspicuous on account of their dark brown colour (Plate XXVIII a).

The material examined agreed very well with Börgesen's account of the species but two minor deviations may be noted. In the first place the filaments are somewhat coarser. Whereas Börgesen states that the filaments have a diameter of 0·6 to 0·7 mm., the Xai-Xai material had diameters of up to 1·0 mm. and sometimes even a little wider. Secondly, although most of the filaments grow vertically at first the majority sooner or later bend more or less horizontally in a manner recalling a diageotropic response. Some branches grow down again towards the substratum.

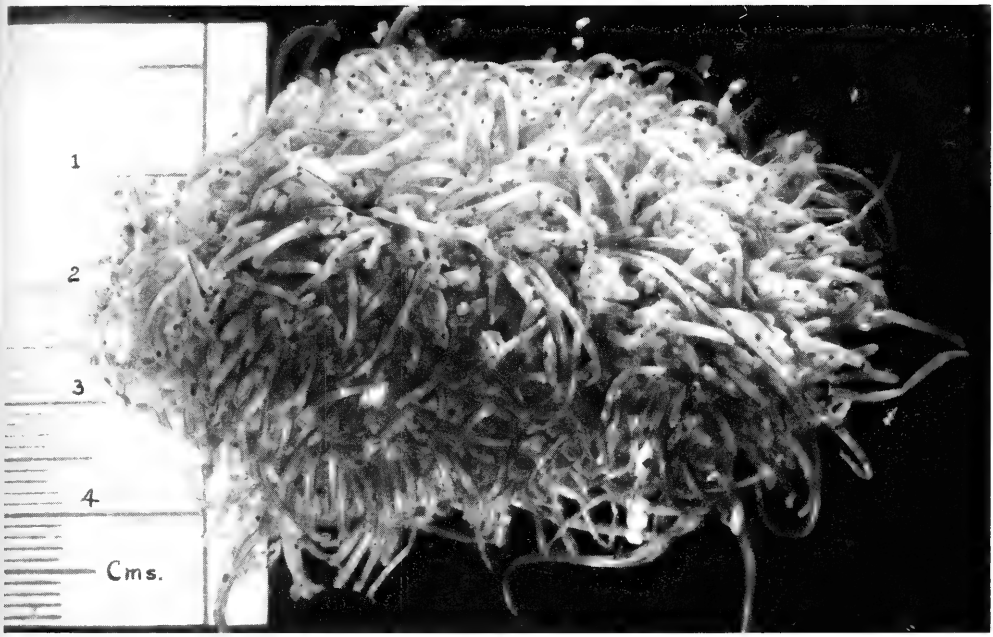
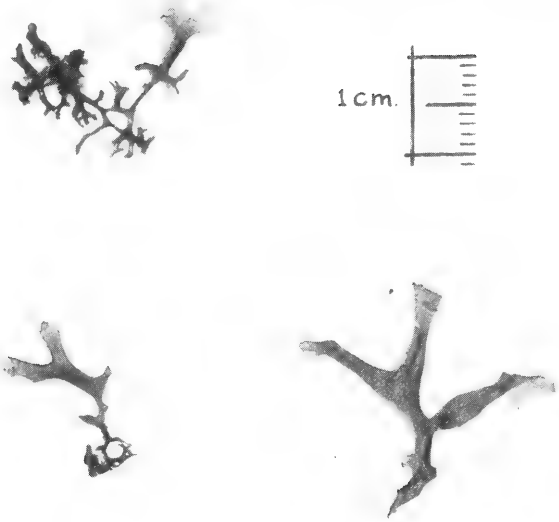


PLATE XXVIII.

a. (upper) *Valoniopsis pachynema* (Mart.) Börgs. Material (B.331) preserved in formalin—sea water. The dark bodies seen in the photograph are small segments cut off by transverse walls, the contents of which have become dark coloured.



b. (lower) *Dictyopteris delicatula* Lamour. (Isaac 708.)

PLATE XXIX.
Range of erect forms of *Pocockiella variegata* (Lamour) Papenfuss.

PHAEOPHYTA

ECTOCARPALES

Ralfsia expansa J. Ag.

See "Inhaca Algae", p. 176.

DICTYOTALES

Dictyopteris delicatula Lamour.

(Lamouroux: *Nouv. Bull. Sc. Soc. Philom.*, 1: 332, Pl. 6, Fig. 2b.)

Vickers: *Phycologia Barbadensis*, Part 2, Pl. 3.

Taylor: *Plants of Bikini*, p. 101.

The plants examined were sterile and small, with a breadth usually of well under 3 mm. and a total height rarely exceeding 2 cm. The basal attaching portion of the plant was well developed and was sometimes more extensive than the erect part (Plate XXVIII b).

It was easy to overlook these plants as they were not obvious on the shore. On disentangling dense clumps of seaweeds a fair amount of this species was found.

Dictyopteris delicatula was collected at Umpangazi on the north Natal coast by Stephenson (1947); Papenfuss (1943) also records the species for the Natal coast.

Dictyopteris longifolia, Papenfuss ined.

See "Inhaca Algae", p. 177, Pl. 39.

Padina commersonii Bory.

See "Inhaca Algae", p. 177, Fig. 13 (p. 178) and Pl. 40.

Pocockiella variegata (Lamour) Papenfuss.

For references to literature see "Inhaca Algae", p. 178.

This polymorphic species includes prostrate forms which are closely adherent to the substratum, prostrate forms which are much more loosely attached to the substratum and erect forms. It is also clear from the literature that the colour varies from brown to almost black.

Throughout these variations the following features are constant.

(1) Anatomical structure.

(2) Characters relating to the structure of the asexual reproductive organs.

In section the plant body is differentiated into three regions. There is a central region consisting of a single series of relatively large cells which are flanked on either side by a cortex consisting of two, three, four or sometimes more cells usually of a length equal to those of the central cells but decidedly narrower. The cortex is typically bounded by an

outer series of smaller cells, in section there being two of these corresponding to the length of the cortical and central cells.

In regard to the reproductive structures of the asexual plant it is now generally agreed that paraphyses are absent and that the loosely aggregated sporangial sorus has an indusium. This indusium is easily lost in sectioning mature fertile asexual plants.

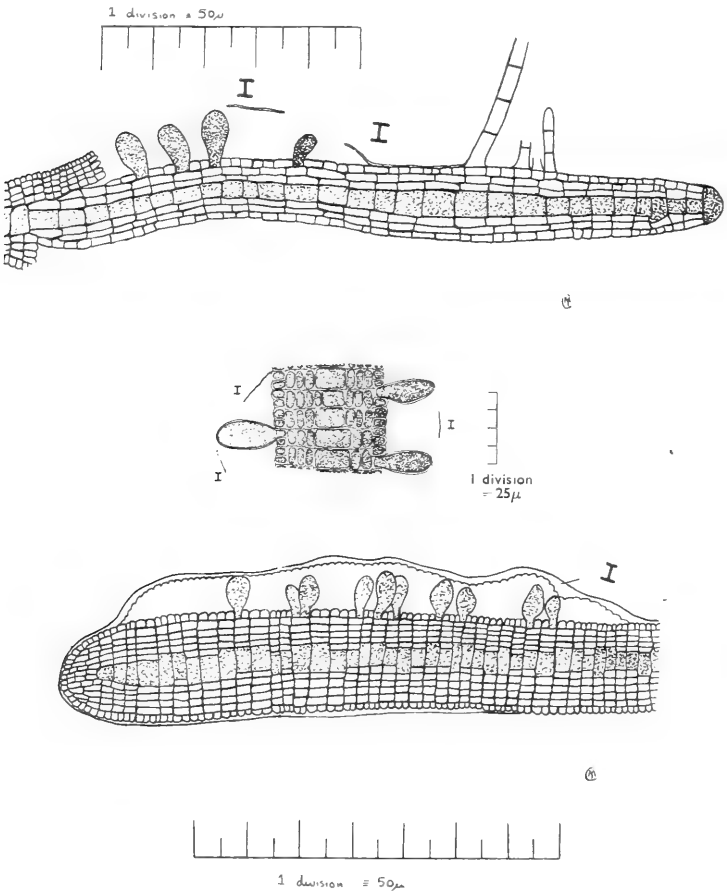


FIG. 8—10. Sections of *Pocockiella variegata* (Lamour) Papenfuss. Fig. 8 (top). B.369, a partly prostrate plant of yellow-brown colour. Fig. 9 (middle). B.370, a dark coloured plant. Fig. 10 (bottom). Isaac 720—the plant shown in the lower right hand corner of Plate 2. I = Indusium.

A number of erect plants and one partly prostrate plant were collected from rock pools on the landward side of the reef at Xai-Xai. These plants varied much in colour and form. Some were almost black in colour, some dark brown and others were medium brown. A range of forms is illustrated in Plate 2. Some of these plants have a simple fan-like form, others while retaining a general fan-like outline are more lobed and cut up into segments. Still others are much lobed and broken up into separate segments and show a greater or lesser degree of divergence of lobes from one another. Throughout these colour and form variations the essentials of anatomical structure remain the same (Figs. 8, 9 and 10). Three specimens (B369, B370 and Isaac 720) were fertile asexual plants. One of these was yellow-brown, partly prostrate, with a fan-like erect portion (B369) and another was dark coloured with division of the thallus into numerous moderately elongated segments (B370). In all these cases the form and dimensions of the sporangia were essentially the same; no paraphyses were observed; and an indusium was present. Special attention may be called to Isaac 720 (Fig. 10). Here the form of the plant approximates towards figures of *Pocockiella nigrescens* (see Papenfuss 1943a, Fig. 15; Kütz, *Tab. Phyc.*, Vol. 9, Pl. 49, Fig. 2) but the anatomy is the same as that of the other plants. A very clearly defined indusium was noted in this specimen. It may be commented here that although Papenfuss considers that *P. nigrescens* may be a distinct species on the basis of Kützing's anatomical figure, the present author fails to see any essential difference in anatomy between Kützing's section for *P. nigrescens*, Papenfuss's section for *P. variegata* and the anatomy shown in Figs. 9 and 10 for plants collected at Xai-Xai and here included under *P. variegata*.

Zonaria subarticulata (Lamour) Papenfuss.

Sub-nom. *Phycopteris cuneata.*

Kütz.: *Tab. Phyc.*, Vol. 9, p. 27, Pl. 67, Fig. 2.

For nomenclature and identity of South African plant, see Sub-nom. *Zonaria cuneata.*

Papenfuss: *Farlowia*, Vol. 1, 340.

Sub-nom. *Zonaria subarticulata.*

Papenfuss: *Jour. S. Afr. Bot.*, Vol. 17, p. 168.

This species has long been known in South Africa as *Zonaria interrupta* (Lamour) Ag. but Papenfuss has shown that this name is incorrect for the South African plant and pointed out that the name should be *Z. cuneata* (Papenfuss, 1944). Later Papenfuss put forward a case for the view that *Zonaria cuneata* and *Z. subarticulata* are conspecific and that the latter name should be used (Papenfuss, 1951). It is not necessary

to go into detail here as the matter was fully dealt with by Papenfuss in his second paper.

The Xai-Xai plants collected are well developed being often about 15 cm. high (Plate XXX). They are somewhat narrower than the South African plants although the latter are usually smaller. Fertile diploid plants were examined and some of these were clearly over ripe as numerous empty sporangea were observed (Fig. 11).

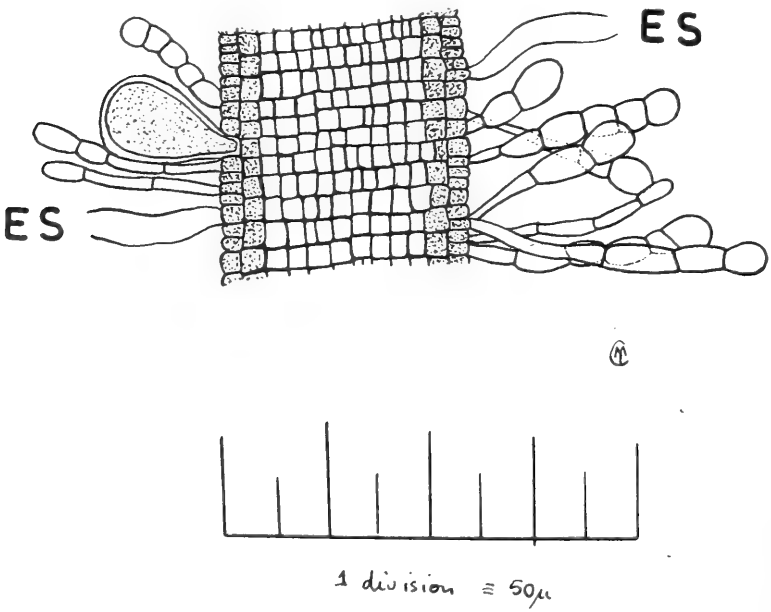


FIG. 11. T.S. of part of sporangial sorus of *Zonaria subarticulata* (Lamour) Papenfuss (B.373) showing two empty sporangia. (E.S. = empty sporangium.)

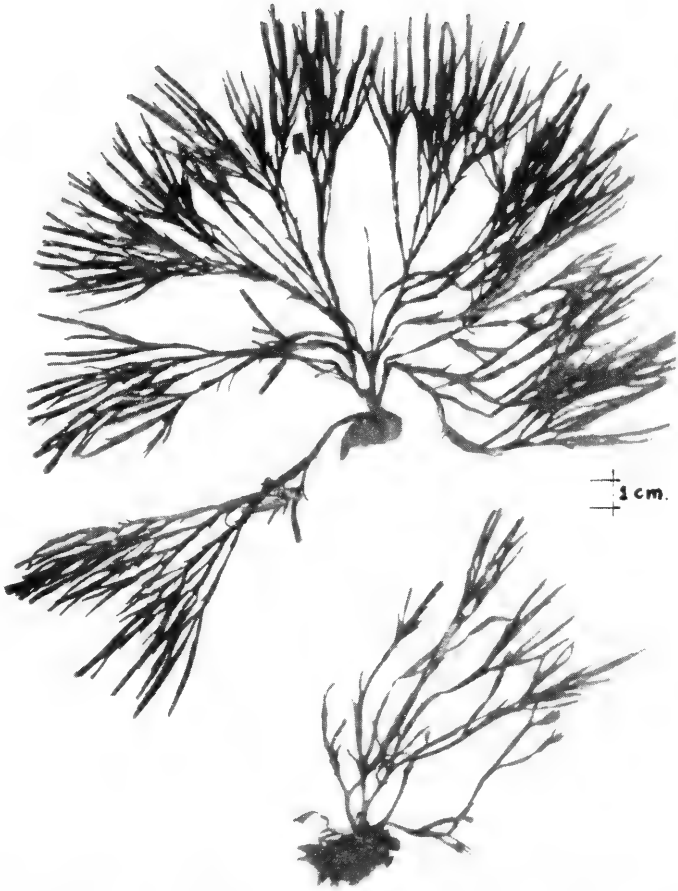
At Xai-Xai *Zonaria subarticulata* dominates the vegetation in many of the long relatively shallow pools of the reef platform where it displays a dense and luxuriant growth.

The plant is widely distributed on the South and East coasts of the Union.

PUNCTARIALES

Colpomenia sinuosa (Roth) Derb et Sol.

See "Inhaca Algae", p. 180.



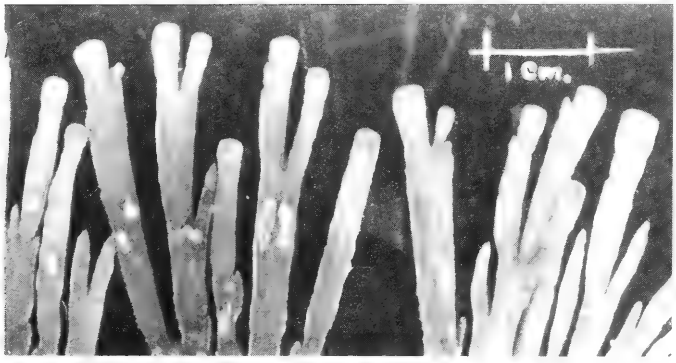


PLATE XXX.

(upper) *Zonaria subarticulata* (Lamour) Papenfuss (Isaac 702).
(lower) Frond apices.

FUCALES

Cystoseira myrica (Gmelin) J. Ag.

Thanks are due to Prof. J. Feldmann for the identification of specimens as being a form of *Cystoseira myrica*. The plant will be dealt with in a subsequent paper on the marine algae of Inhaca Island and the Inhaca Peninsula.

At Xai-Xai this species was widespread and common on the landward side of the reef platform where it was found in pools and around pool margins.

Hormophysa triquetra (L.) Kütz.

See "Inhaca Algae", p. 181, Pl. 42.

This is widespread on the reef platform where it occurs in pools and in situations where it is left more or less uncovered by the receding tide.

Sargassum elegans Suhr.

Suhr: *Flora*, Vol. 23, p. 257.[3]

De Toni: *Sylloge Algarum*, Vol. 3, p. 110.

This species is included by de Toni under "Species imperfecte descriptae, dubiae aut steriles". The available descriptions by von Suhr and by de Toni are certainly meagre.

Diagnostic characteristics given in the descriptions cited above include:

(*a*) Narrow, linear and entire leaf-like segments.
(*b*) Alternating side branches forming a wide angle with the axis bearing them.
(*c*) Receptacles mostly simple and conical.

The identification of specimens by the application of these criteria often presents difficulties as for example, the insistence on entire margins of leaf-like segments. The species needs further study especially in regard to its range of variability. Thus not all of the leaf-like segments on the same plant are necessarily entire and Papenfuss has identified the following plants in the British Museum of Natural History as *Sargassum elegans* although they have widely spaced serrations.

Two sheets from Herb. R. J. Shuttleworth:

(*a*) Reed. 1877 C.B.S. Africa Aust. Legit Drege 1840.
(*b*) Ad Cap. b Spei. Meisner 1834.

One sheet from Herb. Alg. Dickie: 1884.
Cape of Good Hope.

[3]The author is indebted to Mr. R. Ross of the British Museum of Natural History for a written copy of von Suhr's description of this species.

Sargassum elegans is a common plant at Xai-Xai where it occurs in clumps on the reef platform especially at the seaward edge where it is subjected to strong wave action. The plants frequently show a dwarfed growth. It has also been collected at Quissico.

This species is widely distributed on the south and east coasts of the Union where in general it becomes relatively more abundant with increasing sea temperature. This observation was also made by Stephenson (1947).

Sargassum heterophyllum (Turn) C. Ag.

Sub-nom. *Fucus heterophyllus.*

Turner: *Fuci*, Vol. 2, p. 62, Pl. 92 (in part).

Sub-nom. *Fucus incisifolius.*

Turner: *Fuci*, Vol. 4, p. 39, Pl. 214 (in part).

Sub-nom. *Sargassum heterophyllum.*

C. A. Agardh: *Species Algarum*, 1 (1), p. 21 (in part).

Sub-nom. *Sargassum incisifolium.*

C. A. Agardh: *Species Algarum*, 1 (1), p. 14 (in part).

For identity and nomenclature see:

Setchell: *Univ. Calif. Publ. Bot*, Vol. 17, p. 207, Pl. 38.

Papenfuss: *Symbolae Botanicae Upsaliensis*, Vol. 4, No. 3, p. 8.

Papenfuss: *Jour. S. Afr. Bot.*, Vol. 17, p. 171.

Papenfuss (1951, p. 171) states that "observations in the field and study of liquid preserved and dried specimens of *Sargassum incisifolium*" have led him to the conclusion that *S. incisifolium* and *S. heterophyllum* are conspecific. Since *Fucus heterophyllus* was described and figured by Turner in 1809 and *F. incisifolius* in 1819 the earlier name is the valid one. According to Papenfuss "the plants of *S. heterophyllum* tend to be dioecious . . . The plants which are largely male represent the stage which usually has been assigned to *S. incisifolium* and those which contain largely female conceptacles have usually been referred to *S. heterophyllum.*" (Ibid., p. 171.) For details of nomenclature and identity reference should be made to the papers by Setchell and Papenfuss cited above.

Only a few plants of *Sargassum heterophyllum* were collected at Xai-Xai.

This species is widely distributed on the south and east coasts of the Union of South Africa and occurs in the Langebaan—Saldanha lagoon on the west coast in which locality higher sea temperatures occur than are typical for the west coast (Isaac 1937, 1956c). *Sargassum heterophyllum* is most typical of moderately warm waters and becomes progressively less prominent in a northward direction on the east coast of the Union, as was also observed by Stephenson (1947).

FLORIDEAE

NEMALIONALES

Galaxaura corymbifera Kjellm.

(Kjellman: *Galaxaura*, p. 87.)

Kylin: Rhodophyceen von Südafrika, p. 6, Pl. 2, Fig. 5.

This is a common species on the landward side of the reef platform occurring on vertical rock surfaces at low intertidal levels and in rock pools.

G. corymbifera occurs on the Natal coast.

Galaxaura tenera Kjellm.

See "Inhaca Algae", p. 182.

GELIDIALES

Gelidiopsis rigida (Vahl) Web. v. Bosse.

See "Inhaca Algae", p. 182.

Gelidium caespitosum Kylin.

See "Inhaca Algae", p. 183, Fig. 15.

Gelidium reptans (Suhr.) Kylin.

See "Inhaca Algae", p. 184, Fig. 17.

CRYPTONEMIALES (CORALLINACEAE)

Cheilosporum cultratum (Harv.) Aresch.

Areschoug in J. G. Agardh: *Species Genera et Ordines*, Vol. 2, Pt. 2, p. 545.

Manza: *Philippine Jour. Sci.*, Vol. 71, p. 293.

Sub-nom. *Amphiroa cultrata*.

Harvey: *Nereis Australis*, p. 102, Pl. 39.

This species (Fig. 12) is common in places on the reef platform especially near the seaward edge. Fertile tetrasporic material was collected (Fig. 13).

On the Union Coast Stephenson (1947) records this species from Isipingo (near Durban) to St. James on the east coast of the Cape Peninsula.

Jania intermedia Kütz.

Kütz: *Tab. Phyc.*, Vol. 8, p. 37, Pl. 79 I, Pl. 86, IV.

The branching, the form and proportions of the intergenicula (calcified segments) and the character of the fertile branches (Figs. 14 and 15)

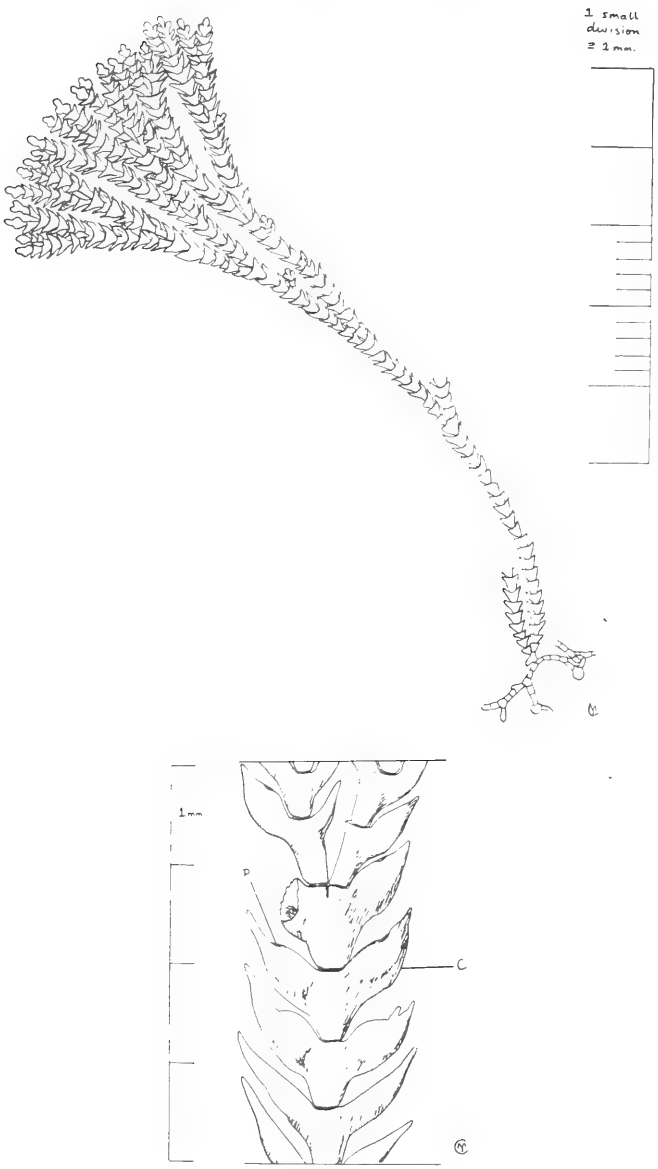


Fig. 12 and 13. *Cheilosporum cultratum* (Harv.) Aresch (B.357). Fig. 12, (top) General habit; Fig. 13 (bottom). Fertile portion more highly magnified. P = pore; C = conceptacle.

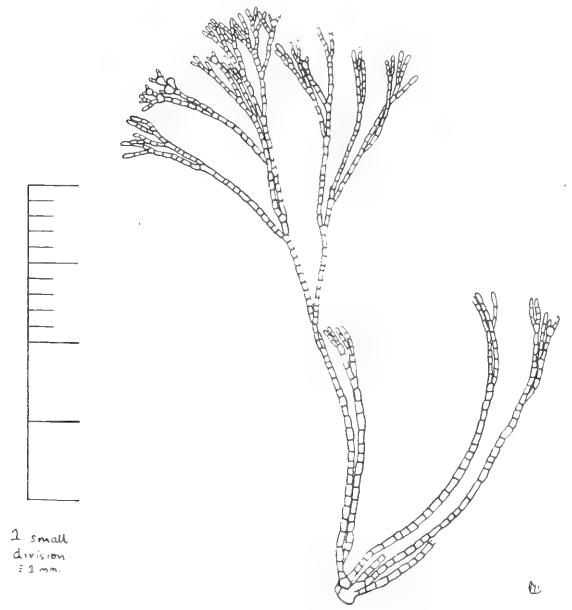


FIG. 14. *Jania intermedia* Kütz (B.358). General habit.

correspond to Kützing's designation as depicted in *Tabulae Phycologicae*. The number of transverse zones per intergeniculum which appear after clearing with dilute hydrochloric acid agrees with Kützing's depiction. For help in determining this material thanks are due to Dr. M. A. Pocock. Much of the material examined was tetrasporic.

This species is listed by Barton (1893, p. 204) who gives the distribution as "Cape" (Hohenack, No. 589). Kützing gives "caput bonae spei". Such wide designations have little meaning.

CRYPTONEMIALES (OTHER THAN CORALLINACEAE)

Peyssonelia capensis Mont.

(Montagne: *Ann. Sci. Nat.*, sér 3, Bot., Vol. 7, p. 177.)

Sub-nom. *Peyssonelia major.*

Kützing: *Species Algarum*, p. 693.

Kützing: *Tab. Phyc.*, Vol. 19, p. 31, Pl. 88.

Kylin: Rhodophyceen von Südafrika, p. 8, Pl. 3, Fig. 6.

According to Papenfuss (1951) *P. capensis* and *P. major* are conspecific. The epithet *capensis* antedates that of *major*.

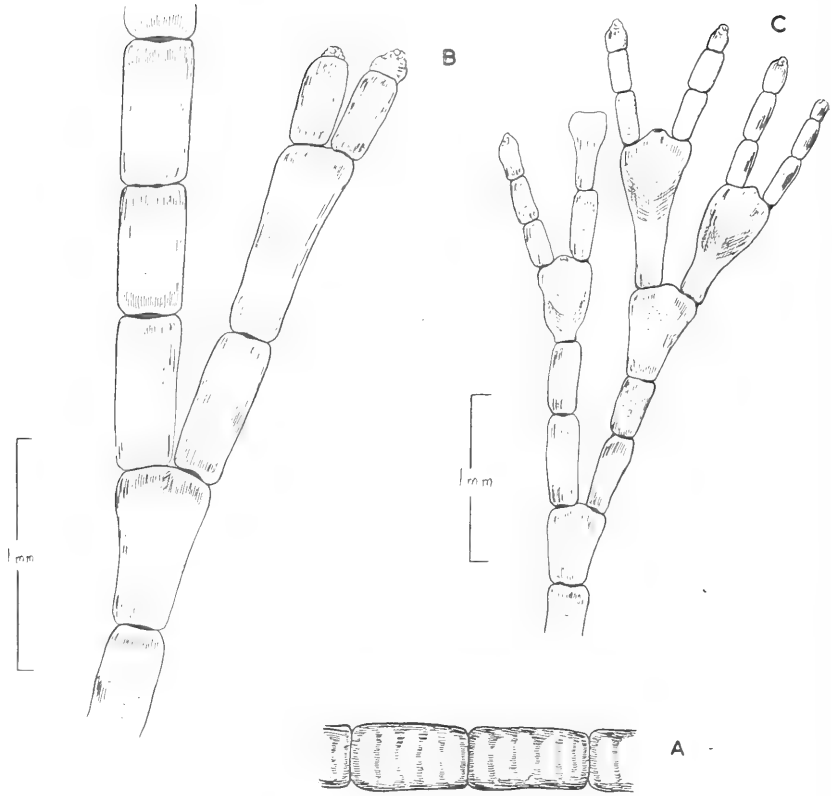


Fig. 15, *Jania intermedia* Kütz (B. 358). A. Portion of frond cleared with hydrochloric acid to show transverse zones. B and C. Details of structure.

This species was common to locally abundant on vertical surfaces on the landward side of the reef.

The distribution data for the Union coast are meagre. Stephenson (1947, p. 307) states: "Probably Umpangazi (and certainly Isipingo) to Richmond, 7 stations. . . . A plant collected at Arniston by M. A. Pocock was also identified by her as this species." Papenfuss (1951, p. 175) writes that this species ". . . is common in certain areas along the eastern coast of South Africa . . .". I have collected *Peyssonelia capensis* at Tergniet near Mossel Bay which is, however, not as far west as the Arniston (east coast of Cape Agulhas) record.

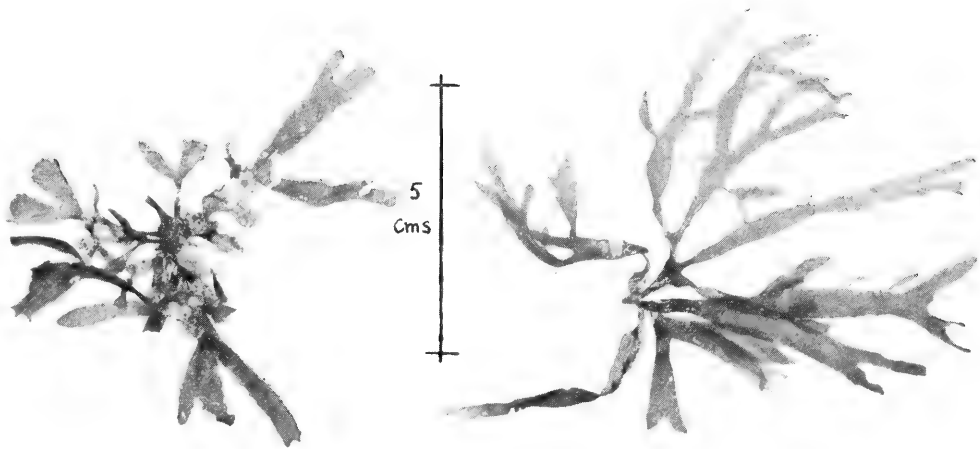


PLATE XXXI. *Gracilaria denticulata* Schmitz ex Mazza. (Isaac 722 and 724.)

PLATE XXXII. Range of forms of *Gracilaria millardetii* (Mont.) J. Ag. collected at Xai-Xai.

GIGARTINALES

Gracilaria denticulata Schmitz ex Mazza.

(Mazza: *Nuova Not.*, Vol. 18, p. 138.)

Sub-nom. *Tylotus denticulatus*

Papenfuss: *Bot. Not.*, 1940, p. 221, Fig. 15.

In a later paper than that cited above, Papenfuss transferred this taxon back to the genus *Gracilaria* (Papenfuss, 1951). Nutritive filaments are present which arise from the gonimoblast and fuse with cells of the pericarp.

Gracilaria denticulata (Plate XXXI) grows on the upper part of the seaward cliff of the reef where it is subjected to considerable wave action.

This species occurs on the east and south-east coasts of the Union.

Gracilaria millardetii (Mont.) J. Ag.

Sub-nom. *Rhodymenia millardetii.*

(Montagne et Millardet: Algues, p. 9, Pl. 25, Fig. 3.)

Sub-nom. **Gracilaria millardetii**.

J. G. Agardh: *Till Alg. Syst.*, VII, p. 64.

Börgesen: Mauritius Marine Algae, III, Pt. 2, p. 72.

,, : ,, ,, ,, Additions *II*, p. 26.

As will be evident from a review of the literature, this is a very variable species. Most of the material collected at Xai-Xai was either a broad *linearifolia* type (Börgesen, 1943, p. 75, Fig. 40) or resembled fairly closely the plant illustrated in Börgesen "Some Marine Algae from Mauritius. Additions *II*", p. 30, Fig. 13. Plants near to var. *crenulata* Börgesen, 1943, p. 74, Fig. 39) were also observed. A range of forms collected at Xai-Xai are illustrated in Plate 5. A number of specimens were examined in section and in all a medulla of large cells flanked on either side by a narrow cortical zone was observed. The sections examined were thicker and had a greater number of cells in section than described and illustrated by Börgesen (1943, Fig. 38, p. 73) who indicates elsewhere, however, that the thicknesses of the thallus varies for the different forms (Börgesen, 1950). Clearly more data are needed for determining the range of variation in anatomical structure.

Several cystocarpic plants were collected at Xai-Xai.

Plants of *Gracilaria millardetii* f. *exposita* Börgs (Isaac, 167, 168) and approaching f. *exposita* (Isaac 166, 815) have been collected by me at Isipingo and Reunion rocks in the Durban area. Cystocarpic material was collected at Isipingo in July 1953. Papenfuss (1943, p. 87) refers to plants of *Gracilaria protea* J. Ag. collected by him on the Natal coast.

Having examined South African material named *Gracilaria protea* by Papenfuss, Börgesen remarks that it seems to him "to be clearly related to if not identical with certain forms of *Gracilaria Millardetii* as he interprets the species." (Börgesen, 1950, p. 36.)

Hypnea rosea Papenfuss.

Univ. Calif. Pubs. Bot., Vol. 23, p. 1, Pl. 1, Fig. 1, Pl. 2, Fig. 5.

Material of this species collected at Xai-Xai agreed very well with material named by Papenfuss in the Stephenson collection in the Botany Department. It agreed also with the description given by Papenfuss in regard to colour, epiphytic habit, intertidal position and anatomy. In regard to morphology, Papenfuss describes the branches as being "beset with short, 0·5—2 mm. long, determinate, spiniform ramuli". As indicated in Fig. 16 the short determinate branches frequently exceeded the dimensions given by Papenfuss.

FIG. 16. *Hypnea rosea* Papenfuss. (Isaac 724; B.419.)

The known distribution range is given by Papenfuss as the Natal coast, on which coast it has been collected by me at a few localities. I have also collected the species at Tergniet, near Mossel Bay. The Tergniet record represents a very considerable westward extension of the recorded distribution range of *Hypnea rosea*.

Plocamium corallorhiza (Turn.) Harv.

Sub-nom. *Fucus corallorhiza*.

Turner: *Fuci*, Vol. 2, p. 70, Pl. 96.

Sub-nom. *Plocamium corallorhiza.*

Harvey: *Nereis Australis*, p. 121.

Sub-nom. *Thamnophora corallorhiza.*

Kütz: *Tab. Phyc.*, Vol. 16, p. 20, Pl. 56.

Tetrasporic material was collected.

This beautiful species is widely distributed on the coasts of the Union, occurring on the east, south and southern parts of the west coast. Fertile plants growing on the coast westwards of East London are larger than fertile plants growing on the east coast, especially those found on the Natal coast. The fertile plants collected at Xai-Xai were of comparable size to those growing on the coast of Natal.

Plocamium glomeratum J. Ag.

See "Inhaca Algae", p. 185.

RHODYMENIALES

Rhodymenia natalensis Kylin.

See "Inhaca Algae", p. 186.

This species was also collected at Quissico by Gomes Pedro.

CERAMIALES

Dasya scoparia Harv.

Harvey: *Nereis Australis*, p. 62, Pl. 21.

The plants from Xai-Xai named *Dasya scoparia* correspond in size, habit and morphology to Harvey's description of the species. There is, however, a divergence in regard to anatomy.

As seen from the locality records given below this species is widely distributed on the east and south-east coasts of the Union: Kei Mouth[4] (Flanagan record cited by Barton, 1893); Kowie[5], Cape Morgan[6] (Delf and Michell, 1921); Port Natal, i.e. Durban (Krauss record cited by Harvey, 1847); Port Elizabeth, East London (Stephenson, 1947).

Localities on the Union coast not cited above at which the plant was collected by me are Dwesa and Port St. Johns, both on the east coast of the Cape Province.

Harvey (1847) also records the species from Green Point which is a little north of Cape Town. Confirmation of this locality record is necessary since it is so far to the west of the other records and since sea temperatures are decidedly lower at Green Point than on the south-east and east coasts of the Union.

[4]Kei Mouth, about 40 miles north of East London.

[5]Kowie or Port Alfred, about 80 miles east of Port Elizabeth.

[6]Cape Morgan, about 5 miles south of Kei Mouth.

Laurencia complanata (Suhr) Kütz.

Sub-nom. *Chondria complanata.*

(Suhr: in Krauss. *Flora*, Vol. 29. p. 211.)

Sub-nom. *Laurencia complanata.*

Kützing: *Species Algarum*. p. 857.

This plant (Plate XXXIII-a) was for long known in the Union as *Laurencia concinna* but in 1943 Papenfuss pointed out that it should be named *L. complanata* (Papenfuss, 1943, p. 91).

It occurs at low intertidal levels at Xai-Xai and on the east coast of the Union.

Martensia elegans Hering.

Hering: *Ann. Mag. Nat. Hist.*, Vol. 8, p. 92.

Harvey: *Nereis Australis*, p. 73, Pl. 43.

Okamura: *Japanese algae*, Vol. 2, p. 5, Pl. 53.

The substitution of *Mesotrema* for *Martensia* was suggested by Papenfuss (1942) who later (1950) proposed that the name *Martensia* should be conserved. Silva (1952, p. 291) concurred with this view. The proposal that *Martensia* should be conserved was adopted at the Paris International Botanical Congress (Lanjouw, 1956, p. 207).

This species (Plate XXXIII b) was found at low levels on the landward side of the reef and thus in situations sheltered from the full force of the sea. The plants when collected were of a dirty straw yellow colour giving the impression of being moribund. When mounted on herbarium sheets and when first put into formalin-sea water, they regained their delicate pink colour. Among the plants collected some were cystocarpic.

Martensia elegans occurs on the east coast of the Union and has been collected by me from a little north of Umhlali[7] to Mpandi which is about 170 miles south of Durban. This range corresponds to that given by Stephenson (1947)—Umhlali to the Haven—who, however, also records a single plant found by Dr. M. A. Pocock at Gonubie, about eight miles north-east of East London.

ACKNOWLEDGEMENTS

Thanks are due to the C.S.I.R. for South Africa for financial aid to collect the material described in this paper and for facilitating investigation of the collected material by the provision of a research assistant.

To Miss Yvonne M. Chamberlain of the British Museum of Natural History I am indebted for her collaboration and help while she was my research assistant at Cape Town University in 1956. All but one of the drawings included in this paper were made by her.

[7]Somewhat over 30 miles north of Durban.

PLATE XXXIII
(a) *Laurencia complanata* (Suhr) Kütz. (Isaac 717).

(b) *Martensia elegans* Hering. (Isaac 718.)

Fig. 15 was drawn by Mrs. Sheila Simons to whom thanks are also due for criticism of the manuscript of this paper.

I wish to thank Mr. Herbert Pahl for his co-operation in providing suitable transport and camping facilities which made the excursion from Lourenço Marques to Xai-Xai possible.

To the various acknowledgements made in this paper I would add my thanks to Mr. R. H. Simons for taking the photographs published here.

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NOTES AND ERRATA TO JOURNAL OF SOUTH AFRICAN BOTANY, SUPPLEMENTARY VOLUME I (1944); THE GENUS OXALIS IN SOUTH AFRICA

By Captain T. M. Salter, R.N.

Page

25 Penultimate line, for 266 read 226.

31 Insert after par. 1: For notes on the formation of the bulbs and the action of the contractile root in seedlings of Oxalis producing endospermous seeds, see Journal of South African Botany, Vol. XVII (1951), p. 190.

31 Par. 2, last 4 lines. See Notes on *O. laburnifolia* Jacq., Part II, p. 18, par. 3. (Journ. of S.A. Bot. XIV (1948).)

35 Par. 3, last 2 lines. See Notes on *O. laburnifolia* Jacq., Part II, p. 15, Aerial bulbils.

38 Line 5, for Sessilifoliae read Sessilifoliatae.

55 In key to Group 2, for (101) *fabaefolia* read (111).

64 In key to Group 10, after line 3 insert:

Petioles flattened: plant producing aerial bulbils ..	(56a) *laburnifolia*
Petioles not flattened: plant not producing aerial bulbils	(56) *purpurea*

75 Line 3, for cuneate-obovate read cuneate-obcordate.

75 Var. **purpurascens** Salter, par. 2, line 2, for petioles read pedicels.

87 Penultimate line, for S.A.M. 49572 read 49752.

124 **O. luteola** var. **minor** Salter, line 2, for 1·5—4 cm. read mm.

129 Par. 2, last line, before near Woodville, insert George Div.

131 Line 4, for *S* 4789 read 4879.

140 Omit **O. purpurea** L. Forms (i), (ii) and (iii). See Notes on *O. laburnifolia* Jacq. and its variety *latifolia*. (Journ. of S.A. Bot. XIV (1948), Part I.)

142 After Species 56 insert Species 56a:

56a. **O. laburnifolia** Jacq. Oxal. (1794) 63, tab. 28—*O. laburnifolia* var. *angustata* Sond.—*O. sanguinea* Jacq., l.c. 64, tab. 29—*O. arthrophylla* Turcz.—*O. purpurea* L. Form E (iii) Salter. Stemless, 3—6 cm. high. *Bulb* broadly or narrowly ovoid, 2—4 cm. long, acute at the apex, the tunics smooth, dark brown: *aerial bulbils* small, very numerous sometimes several hundreds, densely massed in the leaf axils, fully developed about two months after flowering. *Rhizome* usually short. *Leaves* 4—10, spreading:

petioles stout, hispid, somewhat flattened, channelled on the upper side, often red-tinged: leaflets 3, 2—4 cm. long, sparsely pubescent, ciliate, more or less blood-red beneath, dotted with numerous small black streaks when dried, obtuse, the medial oblong-oblanceolate, the lateral narrower, oblique at the base. *Peduncles* 1-fld., hirsute, shorter than the petioles, with 2 alternate bracts below the middle. *Sepals* lanceolate, 4—5 mm. long, with longitudinal black streaks when dried. *Corolla* 2·5—3·5 cm. long, yellow, with a narrowly cyathiform concolorous tube: lamina of the petals cuneate-obovate, attenuate to a rather short claw. *Filaments* glandular-pilose, the longer 3·5—6 mm. long, dentate. *Ovary* callose, pubescent on the upper half, the chambers many-ovuled. *Seeds* endospermous.

Van Rhynsdorp Div.; between Olifants River and Knackisberg, *Zey.* 225; Ouplaas Hills, west of Klaver, *Salter* 5445; 24 miles north of Lamberts Bay, *Nortier* (Kirstenbosch 263/46 cult.); *Leipoldt* 4296. Fl. May—June.

Var. **latifolia** Salter, Forms A and B are described in Journ. of S.A. Bot., Vol. XIV (1948), pp. 14, 15.

175 Penultimate line, for Sessilifoliae read Sessilifoliatae.

191 **O. stenoptera** var. **undulata**, par. 4, line 3, for corolla read calyx.

238 **O. hirta** Form A, line 1, for tab. 53 read tab. 13.

239 **O. hirta** Form B, par. 2, line 3, for *Phillips* 9495 read 9475.

241 Lines 22, 23, for var. *intermedia* read var. *polioeides*.

266 Par. 2, line 1, after Louwpoort for *S* 5489 read 4589.

267 Par. 1, line 3, after Plate VII insert Opp. p. 226.

267 Var. **purpurea**, line 3 and var. **lilacea**, line 3, after Plate VIII insert Opp. p. 227.

267 Par. 2, line 4, after Clanw. Div.: for *S* 7346 read 7246.

283 Par. 3, line 2, for S.A.M. 48376 read 48375.

321 **O. variifolia,** line 2, for *stendodactyla* read *stenodactyla*.

328 **O. ligulata**, in final note, for but it is represented, read and it is *not* represented. None of the poor specimens of Drège 3198 seen by me is the species described by Sonder, they appear to be probably Form B of *O. obtusa* Jacq.

333 For 525 commutata Sond. read 526.

334 For 658 viscosa E. Mey. ex Sond. read 668.

349 For 8158 hirta var. polioeides read 8157.

THE PTERIDOPHYTA OF MARION ISLAND

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and

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(With Plate XXXIV)

During a visit to Marion Island (46° 52′ S. lat., 37° 45′ E. long.) from December 1951 to April 1952, a general collection of plants was made by Mr. R. W. Rand (Rand, 1954). The pteridophytes of this collection form the basis of the present paper. The Hepaticae from the Rand collection were described by Arnell (1953) and a completed treatment of the mosses awaits publication.

The affinities of the fern flora of Marion Island appear to be mainly with species now found in South America, often ranging through the subantarctic islands. Two alternative means of migration could be postulated to explain this distribution pattern. The older authors favoured distribution of the spores by the high winds of these latitudes but some more recent authorities (e.g. Copeland 1939) have regarded these ferns as being derived from a former antarctic flora. Hooker (1847) favoured a past land connection.

If the former were true, it might be expected that the subantarctic islands would show a progressively poorer flora with a larger proportion of ferns going east from Fuegia and that eventually the fern species would tend to disappear eastwards. The actual pattern is less regular. The new Elaphoglossum described in this paper is very near to an Andean species and no corresponding plant is known from the other subantarctic islands.

LYCOPODIACEAE

Lycopodium magellanicum Sw.

Marion Island: *Rand* 3273 (BM, BOL), 3692 (BM, BOL), 3274, 3307, 3371, 3555, 3688 (BOL).

Lycopodium saururus Lam.

Marion Island: *Rand* 3405 (BM, BOL).

HYMENOPHYLLACEAE

Hymenophyllum peltatum (Poir.) Desv.

Marion Island: *Rand* 3285 (BM, BOL), 3767 (BM, BOL), 3283, 3518, 3558, 3565, 3777a (BOL).

This name is used here in the broad sense.

POLYPODIACEAE Subf. Blechnoideae.

Blechnum penna-marina (Poir.) Kuhn.

Marion Island: *Rand* 3269 (BM, BOL), 3369, 3520, 3557, 3609 (BOL).

POLYPODIACEAE Subf. Dryopterideae

Polystichum marionense Alston and Schelpe sp. nov.

Aspidium mohrioides sensu Hemsl., Rep. Voy. Challenger I: 195 (1885) non Bory.

Rhizomate crasso, suberecto, apice squamosissimo, squamis lanceolatis (vel superioribus lineatis), concoloribus; frondibus fasciculatis, 30 cm. longis, 3·5 cm. latis, stipite circa 15 cm. longo, 1·5—2·5 mm. crasso, siccitate pallide fulvido, sparse squamis caducis induto, aliter glabro; laminis circa 15 cm. longis, ambitu anguste oblongo-linearibus, bipinnatifidis vel bipinnatis, pinnis breviter petiolulatis, rotundato-trapezoideis subcoriaceis (sed juventute membranaceis et brevissime mucronulatis), segmentis superioribus ad alam angustiam incisis, segmentis apicalibus confluentibus; nervis pallidioribus, stomatibus occultis; indusiis non visis probabiliter caducis; sporis monoletis, oblongis, crebre rugosis, circa 54 μ longis. (Plate XXXIV, Fig. 1a.)

Marion Island: *Moseley s.n.* Dec. 1873 (BM; holotype); *Rand* 3192 (BM, BOL), 3690 (BM, BOL), 3653, 3720, 3766 (BOL) (paratypes).

This species belongs to the same group as *P. mohrioides* (Bory) Presl, which is found in the Falkland Islands, and is represented by allied species, sometimes considered varieties, in the Andes of Patagonia and South Georgia (*P. plicatum* (Poeppig) Hicken), the Andes of Chile and Argentina (*P. elegans* Remy), the mountains of the western United States (*P. scopulinum* (Eaton) Maxon and *P. lemmoni* Underw.) and New Zealand and the Auckland Islands (*P. cystostegia* (Hook.) Armstr.). The plant from Marion Island is perhaps nearest to *P. lemmoni*, which has similar concolorous scales, but has conspicuous stomata on the lower surface. A plant identified as *P. mohrioides* has been reported from Amsterdam Island (*De l'Isle s.n.*) by Hemsley (1885, p. 273), and an undescribed species has recently been received from the Crozet Islands.

Copeland (1939, p. 181) called *P. mohrioides* in the broad sense "a

PLATE XXXIV. *Polystichum marionense* Alston & Schelpe. Photograph of *Rand 3192* (BOL); paratype. (Approximately $^{6}/_{10}$ natural size).

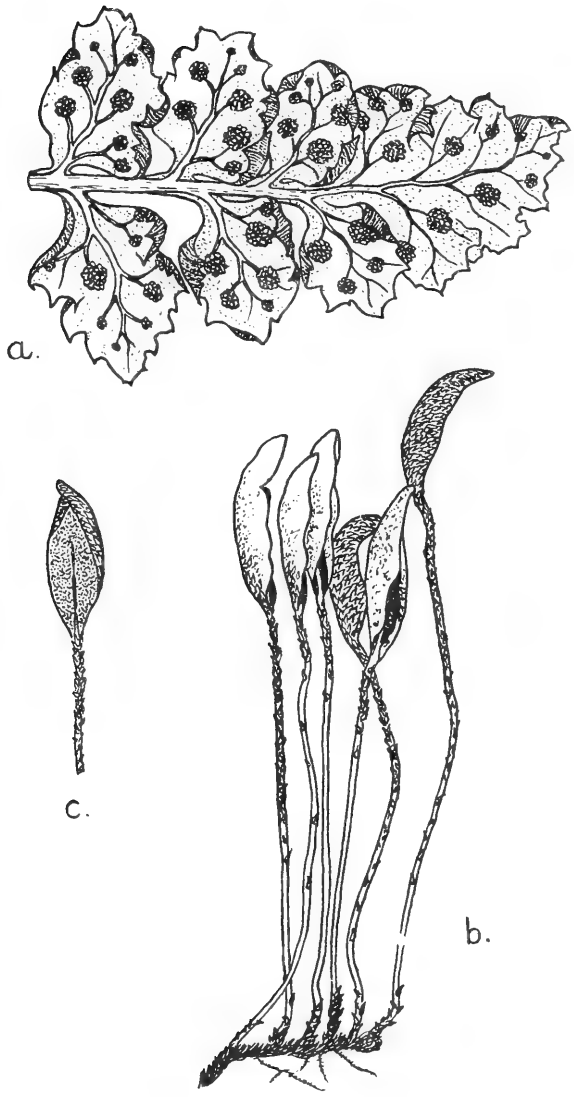

FIG. 1.—*Polystichum marionense*. a. Pinna (× 3). *Elaphoglossum randii*. b. Whole plant (× 1); c. Fertile lamina, undersurface (× 1).

typical survivor of the Antarctic flora", and states that "the case for an Antarctic origin of Polystichum is so clear that the evidence has long been familiar, even to those hesitant to draw the obvious conclusion".

POLYPODIACEAE

Polypodium magellanicum (Desv.) Copel.

Marion Island: *Rand* 3287 (BM, BOL), 3235, 3517, 3559, 3566 (BOL).

POLYPODIACEAE Subfam. Elaphoglossoideae

Elaphoglossum randii Alston & Schelpe sp. nov.

Rhizomate horizontali tenui, vix 1 mm. usque ad 2 mm. crasso, repente vel plus-minusve ascendente, in sicco nigrescente, paleis atro-castaneis, nitentibus, subulatis, 2·5 mm. longis, 0·75 mm. latis, firmis, laxe appressis, margine dentatis, cellulis c. 32 longis, 8 latis, opacis vel marginem versus transparentibus. Frondibus subapproximatis, biserialibus, basi articulatis, stipitibus in sicco brunneis, basi obscurioribus, paleaceis, paleis iis foliorum similibus, 2·5—7·0 cm. longis; laminis foliorum sterilium 2·0—2·5 cm. longis, 0·75—1·0 cm. latis, ovato-oblongis, basi cuneatis, apice obtusis, plerumque involutis, coriaceis, supra in juventute crebre imbricato-paleaceis, vetustioribus tarde glabrescentibus, subtus glabris, pallidioribus, nervis parallelis, bifurcis ad marginem non attingentibus; laminis fertilibus stipitibus longioribus, supra crebre paleaceis, subtus omnino sporangiferis; squamis petioliorum oblongo-ovatis, 1·5 mm. longis, 0·6 mm. latis, basi peltatis, apice leviter attenuatis, bicoloribus, eorum partibus centralibus opacis, brunneis, oblongis, eorum marginibus hyalinis, irregularibus; squamis foliorum pallidioribus; annulorum cellulis 12; sporis monoletis, oblongis, alato-rugosis, c. 43 μ longis. (Fig. 1 b, c.)

Marion Island: *Rand* 3710 (BM, type; BOL, isotype), 3514, 3515, 3691 (BOL; paratypes).

The species is very closely related to *E. hartwegii* (Fée) Moore, an Andean species which is taller and has a stouter rhizome and larger rhizome scales. Another allied species is *E. fonkii* (Phil.) Moore, a little known species from Chile. *E. insulare* C. Chr. from Tristan d'Acunha is less coriaceous with concolorous scales, and does not seem to be closely allied to *E. randii*.

SUMMARY

Two Lycopodia and five species of ferns are recorded from Marion Island. *Polystichum marionense* and *Elaphoglossum randii* are described as new and their affinities are discussed.

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FLORA, FENOLOGIE EN REGENERASIE VAN 'n INHEEMSE WOUDGEMEENSKAP NABY STELLENBOSCH

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ABSTRACT

In the western Cape Province forest communities, mostly small, occur in mountain ravines, along rivers and on talus along the mountain sides. The origin of these forest communities is obscure and three possible origins are mentioned.

The article embodies the results of the study of one such community, about one and a half acres in extent, partly in a ravine and partly on talus, near Stellenbosch. The community consists mainly of one to two tree layers without a dominant species. The trees and shrubs consist mainly of an eastern element, i.e. of species occurring in the Eastern Province, and of a southern or western element, i.e. species which do not occur in the Eastern Province. The characteristic plants of the Cape flora do not occur in the community.

There are slight indications that the community occupied previously a larger area and that at present it maintains itself and is increasing its area.

INLEIDING

In wes-Kaapland kan drie hooftipes van klimaksgemeenskappe onderskei word, naamlik 'n wydverspreide sklerofiele fynbosformasie, wat op die vlaktes en teen die berghange voorkom, klein woudgemeenskappe wat in die beskermde bergklowe, langs die riviere en op talus teen die berghange gevind word en fynbosgemeenskappe wat op die sand langs die kus voorkom.

Die woudgemeenskappe kom verspreid voor van die Kaap tot by Knysna. Die grootte van die afsonderlike woudgemeenskappe verskil en 'n gemeenskap bestaan soms net uit enkele bome. In die distrik van Stellenbosch is nog verskeie van hierdie woudgemeenskappe. Die een wat hier behandel word, is bekend as Assegaaibos en kom voor op die plaas Assegaaibos wat op die wesgrens van die Bosboureservaat in Jonkershoek, Stellenbosch, geleë is.

Hoe hierdie geïsoleerde woudgemeenskappe ontstaan het, is nog onbekend. Dis moontlik dat hulle oorblyfsels is van woude wat voorheen die hele suidwestelike Kaapland beslaan het. Dis ook moontlik dat die woudgemeenskappe nooit die berghange bedek het nie, maar dat hulle tog aaneenlopende gemeenskappe gevorm het wat via die bergklowe, riviere en die seekus met mekaar verbind was. Die moontlikheid dat die woudgemeenskappe by hulle ontstaan reeds geïsoleerd was, kan ook nie buite rekening gelaat word nie.

'n Intensiewe kennis van die woudgemeenskappe kan die basis vorm vir 'n gegronde opvatting oor hul ontstaan. Hierdie artikel behels die resultate van 'n studie van die floristiese samestelling en die regenerasie van so 'n kloofwoudgemeenskap en van die fenologie van die soorte.

Die woudgemeenskap wat hier behandel word, is ongeveer een en 'n half akker groot en lê teen die noord-oostelike hang van Stellenboschberg. Twee stroompies kom in die bos bymekaar en vloei dan as een verder na die Eersterivier in die Jonkershoekvallei. Waar die twee stroompies bymekaar kom is 'n growwe talus gevorm deur tafelbergsandsteen. Op hierdie talus is die gemeenskap die beste ontwikkel. Die twee stroompies wat in die bos bymekaar kom, gee die bos 'n Y-vormige voorkoms. Noord van die vurk, dit wil sê onderkant die plek van saamvloei, is die inheemse bome tot 'n groot mate uitgeroei en gedeeltelik vervang deur ingevoerde eike. Die gedeelte tussen die arms van die Y loop suidwaarts dood teen die regopstaande kranse. Die area tussen die arms vorm gevolglik 'n area wat op 'n natuurlike wyse betreklik goed beskerm is teen veldbrande.

LEWENSVORME

Geen opname is gemaak van die korsmosse en ander Thallophyta, die lewermosse en blaarmosse nie. Hierdie groepe is swak verteenwoordig in die gemeenskap. Ses soorte van die Pteridophyta is waargeneem en almal behoort tot die orde Filicales. Met betrekking tot die saadplante is 7 van Raunkiaer se tien groepe lewensvorme waargeneem, te wete, epifiete (E); mikrofanerofiete (M); nanofanerofiete (N); chamaefiete (Ch); hemikriptofiete (H); geofiete (G) en terofiete (Th). Vetstamplante (S), mega- en mesofanerofiete (MM), hidrofiete en helofiete (HH) ontbreek. In plaas van 'n bepaalde species, word die gemeenskap gedomineer deur mikrofanerofiete soos *Olinia cymosa*, *Gymnosporia acuminata* en *Podocarpus elongatus*.

In onderstaande tabel word die biologiese spectrum van Assegaaibos en van 'n woud aan die ooshang van Tafelberg (Adamson, 1927) en die normale spectrum (Raunkiaer, 1934) aangegee. In die biologiese spectra

van Assegaaibos en Tafelberg is die soorte wat in die woudgrens of in openinge in die woudgemeenskap voorkom, buite rekening gelaat.

TABEL

	Totaal	S	E	MM+M	N	Ch	H	G	HH	Th
Assegaaibos (Stellenbosch)	31	—	—	68	6	3	10	13	—	—
Tafelberg (Woud)	86	—	3	45	10	1	28	14	—	—
Normale Spectrum	400	1	3	23	20	9	27	3	1	13

STRUKTUUR VAN DIE BOS

Verskillende lae of étages is beswaarlik te onderskei. 'n Bodemlaag, struiklaag en twee boomlae kan tog onderskei word.

Op die bodem kom net enkele plante voor. Die rotsagtige geaardheid van die bodem beperk die plante van die bodemlaag tot die openinge tussen die talus en die skeure in die rotse. Die bodemlaag word gevorm deur enkele korsmosse, lewermosse, varings en saadplante soos *Zantedeschia aethiopica* en *Knowltonia vesicatoria*.

In die struiklaag wat 1—2 meter hoog is, kom min struike voor. Die struike word veral gevind naby die kante waar die ligintensiteit hoog is. Die belangrikste struike is *Royena glabra*, *Myrsine africana* en *Brachylaena neriifolia*.

Die boomlaag vorm min of meer 'n dig geslote dak wat baie ongelyk is vanweë die wisselende hoogtes van die bome en wat wissel in kleur van donkergroen tot liggroen. Alhoewel nie so duidelik afgebaken nie, kan op grond van die hoogtes, twee lae, 'n dominante en 'n subdominante, onderskei word. Onder eersgenoemde ressorteer bome 6—8 meter hoog, met *Olinia cymosa*, *Podocarpus elongatus*, *Gymnosporia acuminata* en *Curtisia faginea*. *Podocarpus elongatus* en *Olinia cymosa* kom dikwels in groepies voor. Die subdominante laag, gevorm deur bome 4—6 meter hoog, sluit soorte soos *Cunonia capensis*, *Hartogia capensis*, *Heeria argentea*, *Kiggelaria africana* en *Olea africana* in. *Cunonia capensis* en soorte soos *Platylophus trifoliatus* en *Metrosideros angustifolia*, wat ook in hierdie laag gevind word, is hoofsaaklik beperk tot die stroomwalle.

FENOLOGIE

Uit 'n ontleding van die blomtyd van die boomsoorte wat in die bos aangetref word, blyk dit dat die meeste van die soorte gedurende die somermaande blom. So was 13 van die 20 soorte, gedurende November

in blom. Die soorte wat nie gedurende die somermaande blom nie, is *Brachylaena neriifolia*, *Cunonia capensis*, *Gymnosporia acuminata*, *Heeria argentea*, *Rhus excisa* en *Freylinia oppositifolia*, almal waarvan in blom is gedurende Meimaand. Twee hoogtepunte, een in die somer en een in die herfs, kan dus onderskei word in die blomtyd. Ook is verder gevind dat 9 van die 10 soorte wat ook in die Knysna-woude (Phillips, 1931) gevind word, hier later begin blom as daar. Verdere ondersoek sal nodig wees om vas te stel of dit 'n algemene verskynsel en konstant is.

REGENERASIE

Aandag is gegee aan (i) die natuurlike verjonging van die bos en (ii) of die area van die bos uitbrei of inkrimp.

Verjonging geskied in 'n geringe mate, want die growwe talus en die rotsagtigheid van die bodem is ongunstig vir die vestiging van kiemplante. Net van *Cunonia capensis* en *Brabeium stellatifolium* is kiemplante opgemerk en ook alleen langs die stroom in die regteruitloper. 'n Groter aantal soorte word wel vanaf saad deur jong plante vervang, want enkele jong bome van *Kiggelaria africana*, *Olinia cymosa*, *Halleria lucida* en *Cunonia capensis*, is waargeneem. Hierdie jong bome is gevind naby die kant van die bos.

Verjonging deur die vorming van spruite wat mettertyd onafhanklike bome kan vorm, is waargeneem by *Rapanea melanophleos*.

In die afgelope twintig of meer jare is die plantegroei teen die berghange gereeld gebrand. Hierdie brande loop dood teen die bos, weens die ope geaardheid van die bodemlaag van die bos en die feit dat die plante in die bos 'n gebrekkige brandstapel opbou. Hierdie veldbrande vernietig die bosplante wat in die aangrensende fynbos van die berghang ingedring het. Sodoende word die uitbreiding van die bos verhoed. Omdat dit altyd jong bosplante is wat deur die veldbrande vernietig word, is in die gebrande areas geen aanduiding, soos ou boomstompe, van die bosbome nie en is die bos skerp afgebaken van die fynbos. *Secamone alpinii* kom algemeen buitekant naby die woudgemeenskap voor. Hierdie liane is 'n tipiese woudplant en sy voorkoms buitekant die woud is 'n teken dat die woud voorheen die area waar die liane nou voorkom, beslaan het. *Secamone alpinii* is brandvas as gevolg van sy onderaardse knoppe.

Die area tussen die arms van die twee uitlopers vorm 'n area wat op 'n natuurlike wyse deur die bos en die bergkranse teen brand beskut is. Die grond hier, net soos by die punt van die linkeruitloper, is vir 'n groot gedeelte moerasagtig en bevat plante wat tipies is van die moerasfynbos soos bv. *Osmitopsis asteriscoides*, *Todea barbara* en *Blechnum capense*. Op hierdie areas is enkele jong plante en bome van *Hartogia*

capensis, *Cunonia capensis*, *Brachylaena neriifolia* en *Rapanea melanophleos* waargeneem.

Verder is ook in die area, begrens deur die uitlopers, op 'n rotsagtige droë bodem naby die grense van die bos, *Secamone alpinii* en *Cullumia ciliaris* opgemerk.

Verskeie verskynsels dui daarop dat die bos die vermoë besit om hom te handhaaf en sy area te vergroot. Of die bos deur sy uitbreiding verlore terrein terugwin, is nie so duidelik nie. Ten gunste van die opvatting dat die verlore terrein teruggewin word, kan die verspreiding van *Secamone alpinii* buitekant die bos aangevoer word.

FLORISTIESE VERWANTSKAP

'n Opvallende kenmerk van die woudgemeenskap is dat die tipiese soorte van die Kaapse flora nie daarin voorkom nie. Die soorte wat in die gemeenskap voorkom, kom, egter, algemeen voor in die bergklowe en op talus teen die berghange rondom Stellenbosch en langs die Eersterivier—selfs langs die gedeelte wat deur die dorp vloei.

Curtisia faginea is nog net in Assegaaibos versamel. *Rhus exisa*, ? *Maurocenia frangularia* en *Halleria lucida* is nog nie langs die Eersterivier versamel nie. *Gymnosporia laurina* en *Heeria argentea* is die enigste twee soorte wat teen die berghange weg van waterstrome en weg van talus aangetref word. Beide soorte word meestal by rotse gevind.

Deur die flora van Assegaaibos te vergelyk met dié van Knysna en omstreke soos aangegee deur Fourcade (1941) en Phillips (1931), is vasgestel dat al die soorte behalwe nege, ook in Oos-Kaapland of verder noordwaarts voorkom. Die nege soorte is: *Podocarpus elongatus*, *Brabeium stellatifolium*, *Heeria argentea*, *Cryptocarya angustifolia*, ? *Maurocenia frangularia*, *Metrosideros angustifolia*, *Hartogia capensis*, *Platylophus trifoliatus* en *Royena glabra*. Die eersgenoemde ses soorte kom ook nie in Knysna voor nie. In die woudgemeenskap in Stellenbosch kan dus 'n oostelike element en 'n suidelike of westelike element onderskei word. Die suidelike of westelike element is 'n meer xeromorfe element.

FLORA

In die bos is drie families van die Pteridophyta en een van die Gymnospermae verteenwoordig. Net drie eensaadlobbiges is waargeneem en elke soort behoort tot 'n afsonderlike familie. Negentien families en sesen-twintig soorte van die tweesaadlobbiges is aangeteken.

In die floristiese lys wat volg, word die lewensvorme deur hul erkende

afkortings, die blomtyd (bl.), die maksimale blomtyd (mbl.) en die vrugtyd (vr.) aangedui. Die syfers dui die maande van die jaar aan.

Om die verspreiding van die soorte in die bos en die omgewing aan te dui, word die volgende afkortings gebruik:

B: berghange;
C: langs Eersterivier en langs die stroom onderkant die bos;
Kh: die deel van die bos rondom en by die vurk;
Kul: linkeruitloper van die bos.
Kur: regteruitloper van die bos;
T: area waar daar nie 'n skerp skeiding tussen berghangplantegroei en linkeruitloper van die bos is nie;
V: die area tussen die twee suidelike uitlopers van die bos.

Die aantal individue van 'n soort uitgedruk as persentasie van die totale aantal individue van al die soorte in *Kh*, d.w.s. die aanwesigheid of persentasie word aangedui deur *aanw.*

Voorkeur is gegee aan die plantname soos gebruik deur Adamson en Salter (1950).

Pteridophyta

Gleicheniaceae:

Gleichenia polypodioides. Vorm spore 10; kom net voor in *Kul* onder waterval, afwesig in die res van die bos.

Osmundaceae.

Todea barbara. Vorm spore 6—10; baie skaars, *T*, *Kur.*

Polypodiaceae.

Asplenium adiantum-nigrum. Vorm spore 6—10; baie skaars, op rotse naby water.

Blechnum australe. Vorm spore 9—11, skaars in *Kh*, volop in *Kur*, kom ook voor in *C*.

B. capense. Afwesig in *Kh;* verder dieselfde verspreiding as *B. australe.*

Pellaea pteroides. Vorm spore 8—11, baie skaars in die bos, maar volop in *C*.

Gymnospermae

Podocarpaceae.

Podocarpus elongatus (Geelhout). M; bl. 9—11; vr. 3—6; egalig versprei; volop in *C; aanw.* 10 persent. Die laagste takke van baie van die bome is liggend, veral duidelik waar te neem in *Kh.*

Monocotyledoneae

Araceae.

Zantedeschia aethiopica. G; bl. 6—9; vr. 10—12; baie skaars in *Kh;* volop in *C*.

Iridaceae.

Aristea capitata. G. bl. 11—12; vr. 2—3; kom voor in moerasagtige plekke in *T* en *V*.

Liliaceae.

Aloe mitriformis. Ch; vetblaarplant; kom voor op die rowwe talus waar bome afwesig is; nie in die bos self aanwesig nie.

Dicotyledoneae

Anacardiaceae.

Rhus excisa. M; bl. 3—5; vr. 4—7; baie skaars in *Kh;* in *Kul* en *Kur; aanw.* 0·8 persent.

Heeria argentea (*Kliphout*). M; bl. 3—5; vr. 8—10; kom veral voor naby die rande van die bos; *aanw.* 6·0 persent; waar dit in die bos voorkom, is die blare groter en word minder vruggies geproduseer. Volop op klipperige plekke in *B*.

Aquifoliaceae.

Ilex mitis (*Ilex capensis*) (*Waterhout*). M; bl. 11—12; mbl. 12; vr. 2—3; spruite word gevorm 10; vorm baie vruggies; word gevind naby water; kom veral voor in *C; aanw.* 3·3 persent.

Asclepiadaceae.

Secamone alpinii. Ch; bl. 11—1; vr. 1—3; kom alleen voor op *talus* en rank op teen die bome. Die indiwidue in die bos het baie dikker lote en minder blare as dié buite die bos; blomme is net gevind aan plante buite die bos; skaars in *Kh*, maar volop rondom die bos tussen die klippe.

Celastraceae.

Gymnosporia acuminata (*Sybas*). M; bl. 2—5; mbl. 4; vr. 4—8; vorm baie vruggies; egalig versprei; skaars in *C; aanw.* 12 persent.

Gymnosporia laurina (*Kersboom, klipkersbos*). M; bl. 6—8; vr. 9—11; klein struikagtige boom van 4—5 meter; skaars in die bos, afwesig in *Kul* en *C*, volop in *B; aanw.* 1·5 persent.

? *Maurocenia frangularia.* N; bl. 11—12; vr. 2—3; produseer baie blomme; alleen in *Kh* en is baie skaars; nie waargeneem in die omgewing van die bos nie; *aanw.* 0·5 persent. (Eksemplaar Heyns 47 in STE).

Hartogia capensis (*Lepelhout*). M; bl. 11—12; vr. 7—9; produseer nie baie blomme nie, blare varieer in grootte, die grootte word beïnvloed deur die woonplek; kom verspreid voor deur die hele bos, ook in *B, C, T* en *V; aanw.* 8·3 persent.

Compositae.

Brachylaena neriifolia. M; bl. 3—6; vr. 4—7; kom meestal naby

water voor: volop in *Kul*, baie skaars in *Kh:* kom ook voor in *C*, *B*, *T* en *V*.

Cornaceae.

Curtisia faginea (*Asgaaihout*). M; bl. 12—3; mbl. 2; vr. 9—12; individue aan die rand van die bos produseer meer blomme as dié wat in die middel van die bos voorkom; blare van bome aan die rand van die bos is meer xerofities, d.w.s. kleiner en ligter en dikker; kom hoofsaaklik voor in *Kh*, baie skaars in *Kul* en *Kur;* afwesig in *C* sover bekend; *aanw.* 8·0 persent.

Cunoniaceae.

Cunonia capensis (*Rooi-els*). M; bl. 3—5; mbl. 4; vr. 4—6; kom voor al langs die waterstrome, verder ook in *T*, *V* en *C* en waterryke plekke teen die berghang; *aanw.* 3·2 persent.

Platylophus trifoliatus. M; bl. 1—3; mbl. 2; vr. 3—5; byna beperk tot *Kur; aanw.* 2·3 persent: geen doosvrugte gevind wat oopgebars het nie; die vrugte wat afval word deur die water vervoer en is byna almal in 'n verrotte toestand.

Droseraceae.

Drosera capensis. G; bl. 7—8; kom voor in *Kul*, is baie skaars en kom net voor in nat en skaduweeryke plekke; afwesig in *Kh*.

Ebenaceae.

Royena glabra. N; bl. 9—11; mbl. 10; baie skaars in *Kh;* volop in *B; aanw.* 0·5 persent.

Flacourtiaceae.

Kiggelaria africana (*Spekboom*). M; bl. 10; vr. 12—3; die blare varieer baie in grootte, vorm en beharing; egalig versprei, kom ook voor in *C; aanw.* 6·4 persent.

Lauraceae.

Cryptocarya angustifolia. M; bl. 11—1; vr. 4—5; ontwikkel min blomme; baie skaars; ook in *C; aanw.* 0·6 persent.

Myricaceae.

Myrica conifera. M; bl. 5—7; skaars in *Kul*, meer algemeen in *T:* word ook gevind in *B; aanw.* 1·8 persent.

Myrsinaceae.

Myrsine africana. N; bl. 9—11; baie skaars in *Kh;* ook in *C*.

Rapanea melanophleos (*Myrsine melanophleos*) (*Boekenhout*). M; bl. 8—10; mbl. 9; vr. 1—4; plant ook vegetatief voort deur middel van ondergrondse knoppe op oppervlakkig geleë wortels; vruggies word aangeval deur 'n swam; skaars in *Kur*, *Kul* maar volop in *C;* kom ook voor in *B* en *T; aanw.* 6·0 persent.

Myrtaceae.

Metrosideros angustifolia. M; bl. 1—3; mbl. 3; vr. 2—4; afwesig van

growwe talus; baie skaars in *Kh*; kom voor in *C; aanw.* 0·8 persent.

Oleaceae.

Olea africana (*Olea verrucosa*) (*Olienhout*). M; bl. 10—12; word veral gevind naby vurk; ook in *C* en *B; aanw.* 3·2 persent.

Oliniaceae.

Olinia cymosa (*Hardepeer*). M; bl. 9—11; vr. 1—4; blomme onderhewig aan die aanvalle van 'n insek wat eiers lê in die vrugbeginsel; min vruggies word gevorm; skaars in *C*, maar volop in *Kh; aanw.* 19 persent.

Proteaceae.

Brabeium stellatifolium (*Wilde-amandel*). M; bl. 11—12; mbl. 12; vr. 2—3; sade baie kiemkragtig; skaars in *Kh;* kom net langs die strome voor; volop in *C; aanw.* 3·0 persent.

Ranunculaceae.

Knowltonia capensis. G; bl. 8—10; vr. 10—12; baie skaars en hoofsaaklik in *Kh;* ook in *C; aanw.* 0·6 persent.

Scrophulariaceae.

Freylinia oppositifolia. M; bl. 3—6; vr. 6—7; baie skaars in *Kh;* word ook gevind in *C; aanw.* 0·8 persent.

Halleria lucida. M; bl. 8—10; vr. 9—12; skaars in *Kh;* word ook gevind in die klowe van die berge om Stellenbosch, maar is orals baie skaars; *aanw.* 0·6 persent; stambloeiend.

ERKENNING

Die artikel is gebaseer op navorsing wat gedoen is as vereiste vir die M.Sc.-graad van die Universiteit van Stellenbosch. Graag betuig ek hiermee my erkentlikheid en waardering teenoor dr. P. G. Jordaan, Departement van Plantkunde, Universiteit van Stellenbosch onder wie se leiding die werk gedurende 1947 en 1948 gedoen is.

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BOOK REVIEW

DIE GATTUNGEN DER RHODOPHYCEEN. By Harald Kylin, late Professor of Botany in the University of Lund, Sweden. Edited by Elsa Kylin. C. W. K. Gleerup, Lund, Sweden. In paper cover Sw.crowns 125, cloth binding Sw.crowns 133.

All marine algologists will welcome the appearance of the late Professor Kylin's long awaited work on the Rhodophyceae. Originally written at the request of the publishers of Engler-Prantl's "Die natürlichen Pflanzenfamilien" to replace the 50-year-old section of the Red Algae in the second edition of that work, the war and its aftermath made this impossible and Professor Kylin decided to publish it as a separate work, in part to supersede his earlier "Anatomie der Rhodophyceen", of which all the unsold copies had been destroyed during the war.

The present work embodies most of the subject matter of the earlier one with many additions and emendations from later works of leading algologists as well as the results of Kylin's own researches. The main part of the work was completed before 1945 but resulting from his last revision, Professor Kylin realized that more was still needed. He therefore planned a Supplement for which he made copious notes, but before this could be completed he died in December 1949. On Mme. Kylin, who throughout the work had acted as his assistant, devolved the onerous task of completing this supplement and of bringing up to date the final section, bibliography and index.

The table of contents in itself constitutes a valuable introduction to the modern systematic arrangement of the Rhodophyceae, for which algology is indebted mainly to Professor Kylin's own work. A general survey of the group as a whole—structure, cytology, physiology, distribution, etc.—is followed by a systematic account of the various orders and their sub-divisions, the genera included in each family are analysed and in many cases one or two of the main species of the genus are named.

The format of the work is most pleasing—the print clear, the many figures, as always in Kylin's works, beautifully executed and reproduced. Not the least pleasing feature is the dust cover with its beautiful line-drawing of the apex of *Georgiella confluens*.

The task of editing the work has been a difficult and heavy one and Madame Kylin is to be congratulated on the way she has performed her task.

M. A. POCOCK.

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SOME SOUTH AFRICAN APOMICTIC GRASSES

BY WALTER V. BROWN AND W. H. P. EMERY

(*The Grass Research Project, Plant Research Institute, University of Texas*)

The following South African species of grasses have been found to be apomictic. These data have been extracted from a paper that is to be published elsewhere reporting results of an extensive search for apomixis in grasses. The large number of investigators in South Africa concerned with grass research, both pure and applied, suggested transmission of this information at an early date. The results indicate that apomixis is widespread in the grasses of South Africa, especially in the Paniceae and Andropogoneae, and must be considered in all taxonomic and breeding work involving them. There are, without doubt, many more species in these tribes and a few in other tribes that are apomictic either entirely or in part.

It should be emphasized that if there are *any* apomictic plants in a species, then that species is considered to be apomictic. The results reported here imply only that one or a few plants of each species reported is apomictic, nothing more. Diploid plants of any of these species, for example *Chloris gayana*, are probably sexual. Some groups, such as *Themeda triandra*, *Urochloa*, *Bothriochloa*, *Dichanthium*, are agamic complexes that will require the recognition of the diploid sexual species as the progenitors of the apomictic polyploid "species" (cf. Stebbin's G. L., 1950, p. 396, *Variation and Evolution in Plants*, Columbia Univ. Press, N.Y.). It is quite likely that *Themeda triandra* will be broken up again into a number of diploid and polyploid species. The work of Celarier and Harlan (in press) on progeny tests at the Oklahoma A. and M. College,

Stillwater, Oklahoma, U.S.A., indicates that in some species of *Bothriochloa* and *Dichanthium* there is some sexual reproduction and a few diploid forms.

The species listed below have been characterized as apomictic on the basis of embryological studies of ovules. In all cases except *Fingerhuthia africana*, *Eragrostis curvula*, *E. chloromelas*, and *E. heteromera* the apomictic mechanism was apospory. In *Bothriochloa ischaemum*, *Themeda triandra*, and *Heteropogon contortus*, detailed study has conclusively demonstrated apospory. In others, single or multiple embryo sacs with 4 instead of 8 nuclei has been taken as evidence of apospory.

All presumed apomictic grass species in the tribes Andropogoneae, Paniceae, Chlorideae, and Eragrosteae reported here have 4-nucleate embryo sacs; they lack antipodals. The numerous sexual species studied in these same tribes and genera have the typical grass embryo sac consisting of two synergids, an egg, two polar nuclei, and three or more antipodal cells.

Apomictic South African Grasses.

ANDROPOGONEAE

Bothriochloa intermedia A. Camus (= *B. glabra* A. Camus).
B. radicans (Lehm.) A. Camus
B. pertusa (L.) A. Camus
Dichanthium annulatum Stapf.
D. caricosum A. Camus
Heteropogon contortus (L.) Beauv.
Hyparrhenia hirta (L). Stapf.
H. rufa (Nees) Stapf.
Themeda triandra Forsk.

PANICEAE

Anthephora pubescens Nees.
Brachiaria brizantha (Hochst.) Stapf.
B. serrata (Spreng.) Stapf.
Panicum deustum Thunb.
P. maximum Jacq.
Pennisetum purpureum Schumach.
Tricholaena monachne (Trin.) Stapf. et Hubb.
Urochloa bolbodes (Steud.) Stapf.
U. mosambicenis (Hack.) Dandy
U. pullulans Stapf.
U. trichopus (Hochst.) Stapf.

CHLORIDEAE

Chloris gayana Kunth. (tetraploid only)
Fingerhuthia africana Lehm. (diplospory perhaps)

ERAGROSTEAE

Eragrostis curvula (Schrad.) Nees. (Diplospory probably)
E. chloromelas Steud. (Diplospory probably)
E. heteromera Stapf. (Diplospory probably)

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SPARRMAN AS A CORRESPONDENT (Part II)

By Mia C. Karsten.

(With Plates XXXV and XXXVI)

II. ANDERS SPARRMAN TO CAROLUS LINNAEUS.

Linnean Correspondence, Linnean Society, London.

First Letter

Suburb of Gothenburg, "5 dag Jul
[5th day of Christmas: 29th Dec.], 1771."

Sparrman had arrived at Gothenburg on the 8th. He has got several "naturalia" from Mr. Staf for investigation. They had been mostly collected during a voyage to China, viz. Cancer, Trichinurus, Gobius, Asterias, Boredo, Scolopendra, Plevronectes, Gorgonia.[51]—Some of them Sparrman has not been able to identify owing to lack of time.—The wind seems to be favourable, so he has received orders to go on board the *Castle of Stockholm*. So he only sends Linnaeus some bad drawings of these animals. If Linnaeus should believe the animals to be new, Mr. Staf certainly will be willing to send them for his inspection. He has been one of Linnaeus's disciples, but later became a reader in economics and sheepbreeding. Now he is customs director at Gothenburg, and consequently has good opportunities of getting hold of "naturalia" from travellers who are glad to be able to please such an official.— A *P.S.* about Sedum telephium having cured a sailor of Anasarca[52].—*Enclosure:* drawings of 3 fishes, 1 Cancer, 2 Lumbrici[53], *with a note*, in which he apologizes for bad drawings. The bad result is explained by numb fingers

[51]We have had these names checked, but three of them, viz. Trichinurus, Boredo and Plevronectes (Pleuronectes?) appeared to be obsolete and could not be found in the consulted zoological works. The other animals mentioned by Sparrman include a crab (*Cancer*), a fish (*Gobius;* perhaps *G. nudiceps*, the common Goby, a rock fish in pools, also found on the shores of the Cape Peninsula), a starfish (*Asterias*), a Centipede (*Scolopendra*), and an Alcyonarian (*Gorgonia*), a marine animal forming skeletons known as sea-fans (perhaps *Gorgonia flammea*, the Red Fan Coral?).

[52]Anasarca is a dropsy of the subcutaneous or cellular tissue, characterized by inelastic swelling of the skin. It might be caused by excessive cold. *Sedum telephium*, L., the plant mentioned as a cure for this disease, is known for its medicinal properties. Orpine Stonecrop is the common name of this crassulaceous plant which has its habitat in the temperate regions of Europe and is also found in N. Asia.

[53]Earthworms (pl. of *Lumbricus*).

and darkness drawing near. He has a long way to go to the post office and Mr. STAF's dwelling-house. And this very night he has to go to Elfsborg (the fortress in the Gothenburg estuary) to board the ship. Therefore he is in a hurry.

SECOND LETTER.

"Caput B. Spei d. 2. Maij 1772. Beij Hr van Kirsten in Baij Falso."

"Immediately after my arrival here at the Cape on April 12, I had the honour of writing you in a hurry." SPARRMAN had promised in that note to send some "naturalia", but rainfall, gales, visits, removing and care of his luggage, his pupils (the children of the Resident), etc. have made him postpone their forwarding. Most of the plants he has collected here at Baij Falso have not yet dried enough, and many of those from the Cape were damaged by moisture during the transport. So they must wait till next time. Now in winter there are only a few insects, mostly such as could be found under stones, rotten trees, etc. In spring, three months hence, the mountains and the dry fields are said to be covered with flowers. Next time he will make notes of the plants; which is now impossible because of language difficulties. People seem to tell interesting things, but he does not understand what they say. Mesembryanthemum edule, Hottentotts' file (?)[54] is said to be good for sore legs.

The Hospital at Cape Town was filled up with sick sailors. 66 people were taken in the hospital at Bayo Falso from a Dutch ship in which 103 (out of 340) had died during the passage from Amsterdam to Cape Town. —SPARRMAN has drawn a Sepia[55]. The drawing is included. He also sends a Vespertilio[56], which he will further examine when his patron (and employer!) moves to his country seat (Alphen). He has no bottles, neither any shotgun, otherwise he would collect fishes and birds. In the Garden he saw Equus Zebra, Strutho camelis and casuarius [57], and on the beach two pelicans. After this some notes about things he observed during the voyage. Then he writes: "Before ending this letter I must tell you that I met Dr. Thunberg; a meeting as pleasant to me as surprising to him. If I were lodged at the Cape, I should have good help and training from him. We have made an excursion together. How we wished we had had the

[54] *Carpobrotus edulis*, N. E. Br. (M. edule, L.), Hottentot Fig. SPARRMAN obviously heard the Dutch "vijg", without seeing it in writing!

[55] An ink-fish.

[56] A bat.

[57] *Equus zebra*, the Cape Mountain Zebra; *Struthio australis* (syn. S. camelus), the Ostrich; and the Cassowary (*Casuarius*, a small genus of ostrichlike birds which are confined to New Guinea and nearby islands, and North Queensland, Australia).

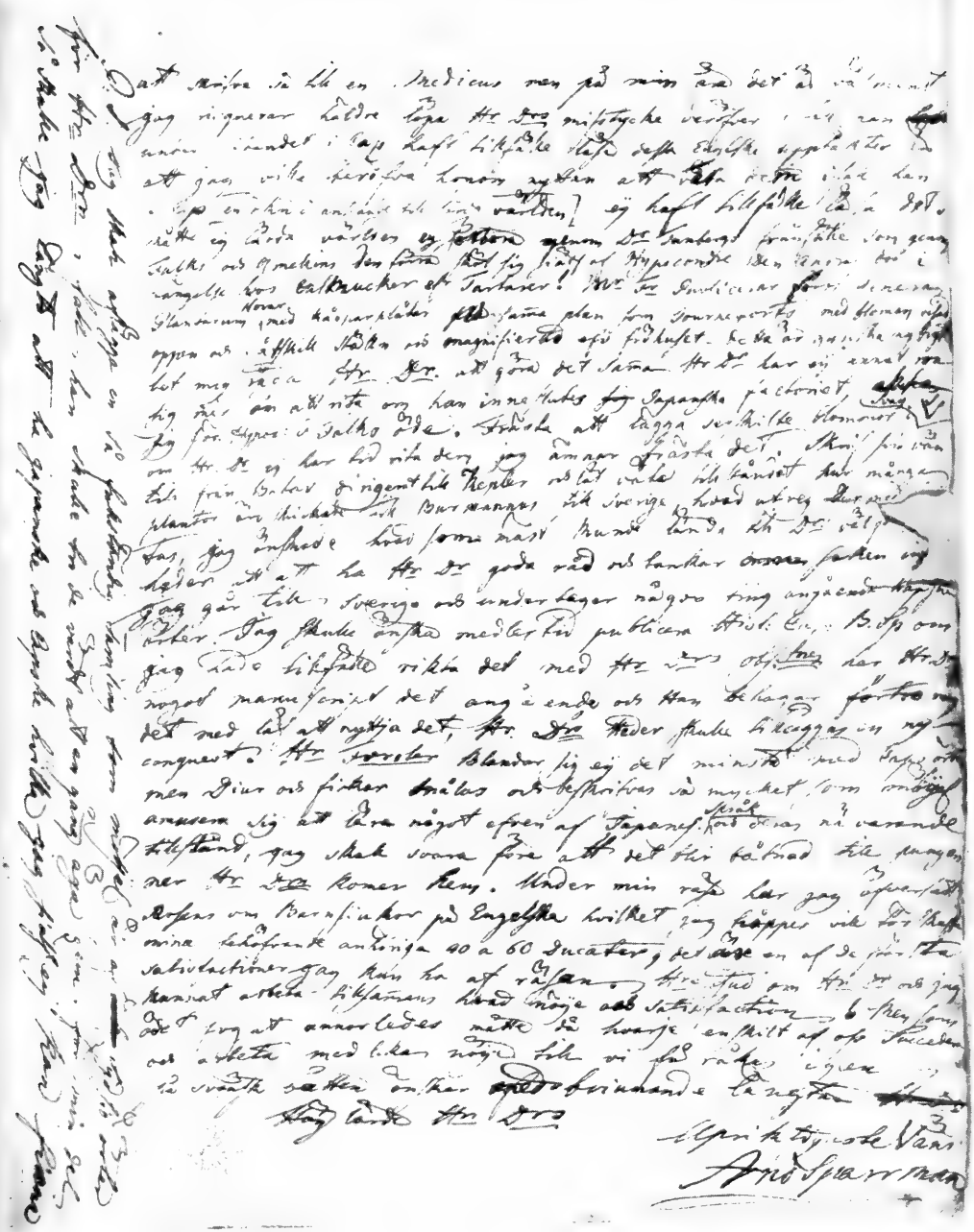

Plate XXXV.

Passage of SPARRMAN's letter to THUNBERG of March 27, 1775, showing his signature (for translation see April issue, pp. 57-58). Courtesy University Library, Upsala.

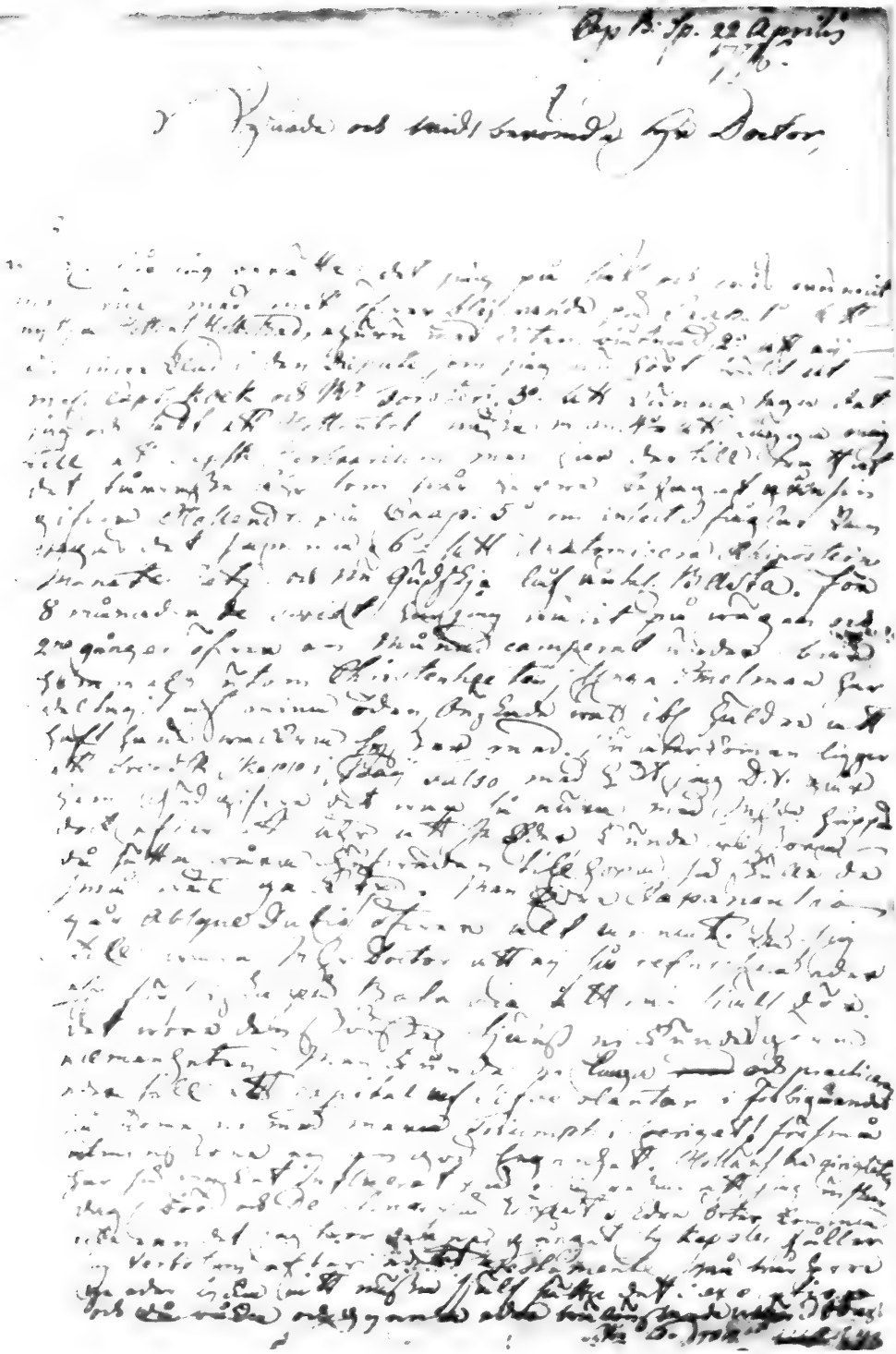

Plate XXXVI.

of SPARRMAN's letter to THUNBERG of April 22, 1776 (for translation see April issue, pp. 62—63).
Courtesy University Library, Upsala

good fortune of having an Archiater Linnaeus to accompany us here! If ever this would be needed, it would be here. I shall see to it that he [THUNBERG] will be accommodated in these parts for the winter in order that I may be trained by him. May-be he can get me appointed as his amanuensis on his long journeys into the interior, but I don't feel enticed to go, since that would mean serving the Dutch, and this would diminish my opportunities to serve the Hortus Upsaliensis any more than I can do by teaching here. This year I shall have to collect here in the neighbourhood.—I now feel the effects of a cold I caught on board. I shall have to go to a warm spaa[58] in the interior, even if it means that I have to borrow the money.

P.S. I am sorry I have not been able to do what you asked of me. Auge[59], the gardener, had got Erysipelas in his face when I was at Cape

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[58] Misspelling of Spa, the name of a town in the province of Liège, Belgium, famous for its mineral springs which have given the common name of "spa" to such resorts.

[59] JAN ANDRIES AUGE, the man in charge of the Company's Garden, was a German who made the Cape his second fatherland. He was born in 1711 at Stolberg in the Harz, and "from an irresistible propensity to the study of plants, which he had acquired as a gardener's boy, he went into Holland before he was 20 years of age, that country being then considered as the principal seat of science in gardening", as related by LICHTENSTEIN. "Here", the author continues, "under the celebrated Boerhaave, he acquired a more than ordinary stock of knowledge in his business". The example of OLDENLAND and Ensign OLOF BERGH who had returned with collections of Cape plants, together with BOERHAAVE's encouragement, made him come out to the Cape. He arrived there in 1747 with letters of recommendation from his patron BOERHAAVE. He was forthwith employed by the Governor H. SWELLENGREBEL as an assistant-gardener in the Company's Garden, while the succeeding Governor, RIJK TULBAGH, with whom, according to LICHTENSTEIN, he was a great favourite because of his botanical knowledge, made him a superintendent of the garden. "He then exerted", LICHTENSTEIN continues, "the utmost diligence to store the garden with every sort of rare African plant, so as to convert it into a true botanic garden." Moreover MACOWAN gives him the credit of having achieved the purpose, viz. by raising the garden above its original cabbage growing into something like a botanic garden . . . quite in contradiction with what SPARRMAN wrote about the garden in 1772! AUGE had reached the age of 61 then, so perhaps he was slackening in his care for the garden in later life.

In 1761-62, thus well before THUNBERG arrived at the Cape, AUGE took part in an expedition towards the North of the country, organized by Governor TULBAGH, Later on, in 1772, he acted as a guide on THUNBERG's first journey into Caffraria.

He collected a large herbarium which was ultimately acquired by Prof. JAN BURMAN at Amsterdam.

AUGE died about 1805 at the farm Rotterdam on the Buffeljagt's River (6 miles from Swellendam) where LICHTENSTEIN visited him in 1804.

Although he had no very high opinion of AUGE's botanical knowledge, THUNBERG showed his appreciation by naming after him the S. African genus *Augea* (Zygophyllaceae).

AUGE's Christian names were originally German, JOHANN ANDREAS, but in view of the fact that he lived at the Cape for the greater part of his long life—preceded by a sojourn in Holland—and ultimately spoke Cape Dutch only, the Dutch transcription of his names, JAN ANDRIES, is to be preferred.

For more about AUGE see our paper on THUNBERG, this Journal, Vol. V, October, 1939, pp. 112 (with footnote 51), 115 and 125; and *The Old Company's Garden at the Cape and its Superintendents* (1951), pp. 129-152.

Town, so I could not get much from him about Portulacca Arbor[60]. He had a lot of beautiful plants and insects for sale at a price of 4 dlr 16./.[61] each. But then one has to buy it all, good and bad. I have got quite another impression of the Garden [the old Company's Garden] than I had before. It is large, but now there are mostly cabbage and other vegetables on all quarters, except only the two which are under the governor's [see footnote 59] windows. There were some beautiful Gnaphalia[62] of which you will have received specimens through the agency of Captain Ekeberg. I have not had time to ascend the Tafelberg. But here at Bayo Falso the mountains seem to be of the very height [sic!], or at least they are steeper." SPARRMAN has observed both at medium height and higher up the mountains such marks as only sea-water can have left. He will make researches into this. (N.B. LINNAEUS was always interested in the traces of "the diminishing of the sea"). SPARRMAN has forwarded LINNAEUS's letter to KÖNIG[63] in Tranquebar[64]. A French officer from Mauritius has offered him to write to COMMERSON[65], a French botanist there. If he gets anything from him, it will be for LINNAEUS. SPARRMAN has sent him a small specimen of Trumpet-grass[66] with root, but this cannot reach Sweden before August of next year (1773), as it has to go to China first with the Swedish ship *Stockholms Slott* (Castle of Stockholm). A list of 52 dried plants was sent with this letter.

THIRD LETTER.

Caffriae in Baij Falso 23 May 1772.

In this letter SPARRMAN gives some further information about the influence of sea-water on the mountains, and shells found high up, as proof of the diminishing of the sea-level.

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[60] The plant meant here is *Portulacaria afra*, Jacq., the "Spekboom" (Portulacaceae), an attractive shrub or small tree with fleshy stems and fresh green fleshy leaves which are flat and roundish. Its flowers are small and of a rosy colour. It is a native of the Karroo and the eastern Cape districts.

[61] 4 Riksdaler (Rixdollars) and 16 öre. See part 1 of our paper, this Journal, April, 1957, p. 59, footnote 26. We do not know whether the old Swedish Riksdaler could be compared with the Dutch Rijksdaalder which now equals a little over 5 shillings. But in any case it seems to us that AUGE charged quite a good price for his plants and insects.

[62] *Helichrysum* spp. (Comp.)

[63] We have not any records about KÖNIG, but we may well assume that he was a merchant and perhaps a representative of the Swedish East-India Company.

[64] A town in India, in the Tanjore district of Madras, on the sea-coast.

[65] PH. COMMERSON (1727—1773), who was also a physician, accompanied L. A. DE BOUGAINVILLE on part of his voyage round the world (1766—1769), and collected over 25,000 plants. In 1768 he stayed behind on Mauritius, whence he visited Madagascar in 1770 and Réunion (called Bourbon at the time) in 1771. In the latter year he returned to Mauritius where he stayed until his death. From Mauritius he sent many plants to the Jardin des Plantes in Paris.

[66] This is *Ecklonia maxima*, (Osbeck) Papenfuss (syn. E. buccinalis), a very common sea-weed and one of the larger thalloid forms. It is now known under the common name of sea-bamboo.

Fourth Letter.

"Baij Falso ad Cap. B. Sp. d. 12. Junii 1772."

Sparrman has now the opportunity of sending the enclosed descriptions and also a parcel of dried plants. He hopes that the plants and insects which he sent a month ago will have arrived safely. It is difficult to find anything of interest because he is so much occupied with half a dozen of children (the Resident's!). He complains of too much social intercourse; people come on a visit from the ships. His patron and his own herbarium have to move very often. Then the latter is more or less spoilt. The Cape would require several years' full-time work of a botanist. The Swedish East-India Company has promised free passage for one. If Linnaeus would further the proposal, the King (Gustaf III) would certainly give a subvention. Sparrman would not be afraid to go to the Kaffirs, etc.—Further he has a request which may be reproduced here in his own words, viz.: "If there is a new genus of plants among those sent to you, I would ask it to be called after Capt. Ekeberg as *causa principalis*[67] to my voyage."—After this Sparrman writes that he has asked Thunberg to answer Linnaeus's question about Portulaca Arborescens[68] and Sagittarius[69], as the latter lives in the Town and knows the language.

Fifth Letter.

"Baij Fals. d. 22 Julii 1772."

This is the fourth letter since he came out. They had to be sent with different people, dependent on their care. This one is being sent with Lieutenant Durham, to be forwarded through his friends in London. This gentleman is going to Bengal. He is a little at home in Medicine and Materia Medica. Then he writes: "We made an excursion together and found some shells on the mountains; he accepted my idea that they prove the Sea to have been higher before. Now it is winter here, but as yet there is no snow." Sparrman had formerly said that all snakes hibernate, but now he is not quite sure about it. The rest of this letter may be reproduced here in his own words. "Is the Simia[70] of which the description is included a new one?? Mr. Gandelet[71], mentioned as its owner, has promised to send a plant from Mauritius, the root of which is similar to Ipecacuanha[72], and which is used for the same purpose in a double dose. We shall see if it

[67] The primary cause.
[68] *Portulacaria afra*, Jacq. (see footnote 60).
[69] The identity of this plant we cannot even guess.
[70] One of the old world monkeys.
[71] We cannot trace this name.
[72] Ipecacuanha root is used in medicine as an emetic. It comes from *Cephaelis Ipecacuanha*, a Brazilian plant of a trailing habit, belonging to the Rubiaceae.

is a Viola. n.b. if we receive a specimen. My letters went 1) through the agency of Viljam Villson, London, Commissioner of the Swed. East-India Company; 2) through the agency of Director Malm of Gothenburg [of the E. I. Company] with the "Granville", Capt. Burnett Abercromby—the "opperstyrman"[73] took the letter and a parcel of plants and insects; 3) with the "Norths"[?], Capt. Hemli[?]. A passenger took this last letter and should give it to the Swedish envoy in London, von Nolcken. I have written before that I wish a plant to be named Ekebergia and to be described in the Act. Holmensibus [the Transactions of the Academy of Science at Stockholm]. As ships are sailing [literally: going—transl.] from England also in April, I hope to receive your answer next year. Please let my mother know when you are writing, and let a little letter from her follow."

SIXTH LETTER.

"Caput Bonae Spei d. 21 Novembris 1772."

SPARRMAN starts this letter by saying: "When this arrives you already have received one parcel with plants, a case with insects and a bottle containing animals in spirit." After this he complains of his poor opportunities of botanizing, owing to his being a school master and living in winter by the dry cliffs of Bay Falso, and in spring among the Ericeta[74] or barren fields outside town.—He has had an eight days' leave which he spent making an excursion with a Hottentot as a guide. As he has now got some idea of the African landscape, he understands what the clever Dr. THUNBERG will be able to do on a five months' journey. THUNBERG had asked SPARRMAN to convey his compliments to LINNAEUS (literally: sent his compliments through Sp.'s intermediary) before he set out on his journey, and promised to send specimens of the produce of this country (in the first place plants, we presume) at his return. There are many collectors busy beside. "Therefore", he writes, "I found that I could accept with a good conscience Mr. Forster's offer to go with the British ships to the South and round the world." Further he tells about arrangements on board, facilities and books for reference, etc.[75]—SPARRMAN knows that FORSTER intends to send LINNAEUS his plants, but he thinks it may be useful that there is a Swede on board. When back at the Cape (from his voyage towards the South Pole, etc.) he expects to be so well trained that he will be able to do in one year what he would not be able to

[73] Chief mate.

[74] Ericeta (pl. of ericetum), heath-lands. Here at the Cape a vegetation mainly consisting of *Erica* spp.; in Northern Europe large surfaces are covered with the common heather (ling), *Calluna vulgaris*, (L.) Salisb.—SPARRMAN refers here to the country round Alphen.

[75] cf. SPARRMAN's letter to THUNBERG of November, 1772.

do now in three years. If only he could get some subvention!! He would like to go to India afterwards. He hopes that he will have LINNAEUS's answers about his plants at his return, through the agency of Mr. KIRSTEN. It is impossible now to send his notes and plants, but they will be forwarded through Dr. THUNBERG's intermediary.—The Cape is a place for botanists now. All people who pass, purchase plant collections here. Gardeners from many parts have gathered here, it almost looks as if every botanist in Europe had his special representative and correspondent here at the Cape. The members of the Government have their own agents for collecting plants in order to make gifts to important people. A captain or Supercargo can buy in a moment what another person would take half a year to get, etc.—SPARRMAN has sent some descriptions of plants to the Royal Society in order to become known to them.

SEVENTH LETTER.

Cap. B. Sp. 1775, Apr. 26.

At his return to the Cape a month ago he wrote with a Dutch ship. The seeds mentioned in that letter (literally: at that time—transl.) will be forwarded by Captain EKEBERG and the Academy of Science. A sort of bean from Madagascar has been sent through the agency of Director MALM at Gothenburg. SPARRMAN will stay at his own expense for one year in order to be cured from rheumatism in his hands. After this he writes: "We followed your principles at our work, and we often drank your health in the Arctic Zone[76],—If you had favoured me with the title of M.D.[77], it would have been a good help. But now I missed the opportunity of getting a beautiful collection from Madagascar, and possibly even one from Manilla. Since Mr. Forster intends to send you plants himself from London, I am bound not to give you what I have got here. It is a pity that Dr. Thunberg has left. He could have given me good advice. In case you have any wishes, please write through the intermediary of Dr. Montin who will send the letter by way of Holland."

The above letter is the last one addressed to LINNAEUS.

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[76] An inaccuracy of SPARRMAN's! Read: . . . the Antarctic Zone.

[77] About 7½ months later the degree he fancied so much was bestowed on him by the University of Upsala (see Introduction.)

[78] Royal Secretary and Chevalier PEHR WARGENTIN is known as the author of a paper on the irregularities which the moons of the planet Jupiter produce in each other's motion through their mutual attractive forces, published in K. Vetenskaps-akademiens Handlingar (Transactions of the R. Acad. of Science), 1748.

MISCELLANEOUS.

(8) ANDERS SPARRMAN to PEHR WILHELM WARGENTIN[78], Secretary of the Academy of Science.

A little note, not dated, with seeds for LINNAEUS and others (i.e. BERGIUS, MONTIN), collected in the Southern Hemisphere during his voyage with the British ships, viz. 14 sacks of seeds from New Zealand, New Rotterdam[79], etc. The note contains some remarks about soil, etc.

(9) A fragment of a letter by LINNAEUS *filius*, viz. an introduction to a paper about a plant found by SPARRMAN (Erica Sparmannia[80], publ. Sv. Vetenskaps-Akademiens Handlingar 1778).

The younger LINNAEUS talks about botanical investigations in the Cape Colony by THUNBERG, SPARRMAN and others. About SPARRMAN he writes: "Doctor Sparrman, after having visited the South Pole with botanical eyes, as far as ice and cold permitted sailing, came back to the Cape, and in order not to pass his time at such place without use to Science, at his own expense made an extensive excursion of about 200 miles[81] from the Cape into the interior. During this journey he found, among many other unknown plants, at Krumme Rivier (about 150 miles from the Cape) this plant of a genus of which the Cape had before offered 30 species . . . " [no more].

(10) Enclosure with one of the SPARRMAN letters: 2 pencil-drawings of a Crab. At the back of these sketches some notes in Swedish about a

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[79]Re "New Rotterdam", in Voyage, Vol. I, p. 95, SPARRMAN writes: " . . . went on to Namocka or New Rotterdam, one of the Friendly Isles above mentioned." This island was originally named "Rotterdam" by the Dutch navigator ABEL TASMAN ca 1644, but it is now called Nomuka or Namuka. It belongs to the Tonga Archipelago or Friendly Islands (the latter name being still used as an alternative for Tonga). SPARRMAN apparently has added the prefix "New" in analogy with New Zealand.

[80] *Erica sparrmani*, L. f.; see also Introduction.

[81] The mileage given by the younger LINNAEUS (distances of 200 and 150 miles) needs some explanation. It was pointed out by Mr. FORBES that the distance from the Cape to the Great Fish River near Cookhouse by the route followed by SPARRMAN would be in the vicinity of 650 English miles, further that S. must have encountered the Kromme River first in Long. 24°5′ at Kompanies Drift some 400 miles by road from the Cape, and must have left it near Humansdorp about 450 miles from the Cape. But what mile was LINNAEUS *filius* using? It cannot possibly be the Swedish or Scandinavian mile, as this equals over 6 English miles. Mr. FORBES who went into the subject extensively, informs us that the Swedish word for a mile could also be taken to mean a *league*. However, there were several leagues then in use, inter alia the French league and the sea league, the latter equalling 3.45 English miles. The English league, which was less common in those days, equals about 3 miles. If we divide the distances in English mileage by 3, they agree tolerably with those given by LINNAEUS *fil.*, which makes it evident that the mile he used must be taken to mean a league. The *Erica* referred to by LINNAEUS *fil.* must have been found near Humansdorp.

new plant genus, belonging to Triandria Hexagyna[82], of which he has sent the description to the Royal Society[83], and to which he proposes to give the name *Forstera:* "Dno Forstero dicavi in nomen ejus siquidem itineris periculosissimi sui comitem me adjunxit."[84] He adds to this: "I have sent it to London, described and well designed, and it might be entered in the Acta Anglicana with the name given above. And you will, I hope, thereafter introduce it into your Systema[85]. It differs too much from Morea and other plants than that it could be brought to them." LINNAEUS has noted the name "Forstera" and he himself seems to have made an ink-drawing of a flower on the sheet.

ADDENDA ET CORRIGENDA.

To SPARRMAN as a Correspondent I, Journ. of S. Afr. Botany, Vol. XXIII, Part II, April, 1957.

Introduction.

P.44—We are indebted to the Chief Archivist at Cape Town for some additional information about the activities of the Resident, also called Postholder, at Simon's Bay (Simonstown on False Bay). It was his main duty to see to it that ships which called there were provided with whatever they needed, which entailed a good deal of correspondence, mainly with the authorities at the Castle, which he had to do himself. He also reported the movements of the shipping at Simon's Bay. The Archives do not state explicitly that he was the official representative of the Dutch East-India Company at Simon's Bay, but we may safely assume that this was the case. Undoubtedly the then Resident, Mynheer KIRSTEN, SPARRMAN's patron and employer, exercised his influence to enable SPARRMAN to undertake a journey into the interior of the Colony.

P.47—With reference to some geographical names given in the short survey of SPARRMAN's voyage to the Antarctic, the following may be added: Dusky Bay is now known as Dusky *Sound*; Huaheine is one of the Society Islands, its spelling is still the same; also Queen Charlotte's Sound still goes by that name. As to Easter Island, it still retains its name, but in Spanish translation, *Isla de Pascua*, as it is called in Chile to which it now belongs.

On the same page mention is made of the fact that the *Resolution* and the *Adventure* were separated in a storm on the coast of New Zealand, and were to sail separately for the rest of the journey. We may add that the *Adventure* arrived in Europe a year before the ship commanded by Capt. COOK (SPARRMAN, *Voyage*, Vol. I, p. 91).

P.48—It may interest our readers that the present University Librarian at Cape Town, Mr. R. F. M. IMMELMAN, is a direct descendant of DANIEL FERDINAND IMMELMAN, the youth who accompanied THUNBERG and SPARRMAN on their journeys into the interior. We are greatly indebted to Mr. IMMELMAN for the following genealogical notes.

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[82] Triandrous and hexagynous plants (3-stamened and with 6 pistils): *Forstera*, L. f.; cf. SPARRMAN's first letter to THUNBERG, sent from the Cape, Nov. 1772, and footnotes 6 and 7.

[83] The Royal Academy of Science, London? cf. SPARRMAN's first letter to THUNBERG.

[84] Transl.: "I have dedicated this genus to the name of Mr. FORSTER, since he has included me as his companion in his most dangerous journey."

[85] SPARRMAN obviously refers to LINNAEUS's *Systema Naturae*, first published in Holland in 1735. Many editions followed; the 10th, in which for the first time the binary nomenclature was also applied to zoology, in 1758.

DANIEL FERDINAND'S father, the ancestor, was JOBS (or JUSTUS) LULOLPH IMMELMAN, a German and a native of the village of Grasdorf. As there are several villages going by that name, Mr. IMMELMAN has not yet been able to find out in what part of Germany the village in question is situated. JOBS IMMELMAN came out to the Cape in 1741, as a soldier in the service of the Dutch East-India Company. 1752 saw his promotion as an ensign, later on he became a lieutenant. In 1755, when he was still an ensign, he married SARA CHRISTINA VAN STEENWIJK, the widow of the minister ("predikant") of Stellenbosch, the Rev. E. ARENTS (or Arends or Arendsen). DANIEL FERDINAND, who was baptized on March 21, 1756, married CATHARINA MAASDORP on December 8, 1776. They had no less than 13 children, and all Immelmans have sprung from them. DANIEL FERDINAND'S sister with whom SPARRMAN also was acquainted, was called ANNA CHRISTINA. She married JOHANNES AUGUSTUS BRESLER in 1780, and gave birth to two daughters and a son. (Ref. E. MORITZ, *Die Deutschen am Kap unter der holländischen Herrschaft*, 1652—1806 (Weimar, 1938), p. 316; and DE VILLIERS, *Geslachtregister* (Kaapstad, 1893), Vol. A—J, p. 364).

We should have made a reference to THUNBERG'S *Travels*, Vol. I (1795), p. 141 (The Cape, 1772), where we find IMMELMAN mentioned as one of THUNBERG'S travelling companions on his first journey into the interior, viz. " . . . M. IMMELMAN, a youth, the son of a lieutenant in the army." Although no Christian names are given, it is evident that it was DANIEL FERDINAND THUNBERG was writing about. And he may well have recommended the young man to SPARRMAN.

P.49—Also THUNBERG paid tribute to SPARRMAN, by naming after him a new species of an iridaceous genus, which he collected on one of his journeys into Caffraria, viz. "Gladiolus Sparrmanni, et nytt Species, beskrifvet" (K. Vet. Acad. Handlingar för 1814, p. 189, Tab. IX A). Much later, after several of THUNBERG'S Gladiolus spp. had been separated from that genus and included in the genus. *Freesia*, Klatt, this species was renamed by the late Dr. N., E. BROWN *Freesia sparrmani*, (Thunb.) N. E. Br. (we have rectified the original spelling Sparrmanni). It is a native of the coastal districts of Swellendam, Riversdale, Ladismith, etc. This species is not *F. refracta* as named by KLATT and by BAKER.

The same page, 9th line from below—read: " . . . SPARRMAN had reached the Assegai Bosch E. of the Bushman's River (Eastern Cape)." As a matter of fact there are two forests going by that name, and we have erroneously identified the one referred to with the forest at the foot of the Tsitzikama Mountains (Humansdorp district), entirely overlooking the fact that SPARRMAN had penetrated further eastwards at the time mentioned. In Vol. II of his *Voyage*, p. 76, SPARRMAN writes that on December 14 (1775), at 5 o'clock in the morning they left "Boshies-mans rivier" and in the evening arrived at "Hassagai-Bosch". Three days later, on the 17th (p. 81), they arrived before night at "Quammadacka Well" (Commadagga) on their way up country. The precise whereabouts of the Assegai Bosch referred to is E. of the Bushman's River, between Alicedale and Sidbury, about 18 miles W.S.W. of Grahamstown.

Sparrman's first letter to Thunberg, Caput B: Spei: d.—Novembris 1772.

P.53, 6th and 7th line from below—"The Captain . . . is the same as the one Solander went with." The person mentioned here was a Swede, DANIEL SOLANDER, born at Pitea, Norrland, Sweden, in 1736, and died in London in 1782. He was a naturalist and a favourite pupil of LINNAEUS. In 1760 he settled in England where he lived until his death. In 1763 he became assistant-librarian at the British Museum. He accompanied Sir JOSEPH BANKS on Captain COOK'S first voyage round the world in the *Endeavour* (1768—71). They sailed across the Pacific to Tahiti (then called "Otaheite"), where SOLANDER stayed for three months and made considerable collections of the rich tropical flora. Back in England, BANKS appointed him as his librarian (1771), and two years later he became a conservator of the natural history department of the British Museum.

Sparrman's second letter to Thunberg, Cape Town, March 27, 1775.

P.56, 2nd line from below—according to Dr. Lind, etc. This name sounding rather Swedish, we mistook the doctor SPARRMAN writes about for a fellow-countryman of his. After part I of our paper had been published, Mr. FORBES kindly drew our attention to a naval surgeon of the name of LIND he came across in *Dictionary*

of National Biography, Vol. XXXIII (1893), pp.271—2. The biographical account given of Dr. JAMES LIND leaves not the slightest doubt as to the identity of the person in question. Dr. LIND, a physician, born in Scotland in 1716, became a surgeon in the navy, was at Minorca under Admiral HADDOCK in 1739, and served for some time on the coast of Guinea as well as in the West Indies, Mediterranean and Channel. In 1768 he wrote *An Essay on Diseases incidental to Europeans in Hot Climates*, of which no less than 5 editions appeared during his life, and also French and German translations. Dr. LIND's medical advice as to how to preserve good health in hot climates, quoted by SPARRMAN, must have been taken from this essay. Dr. LIND is particularly known as the author of a treatise on scurvy. Actually, he found a cure for this ailment. He died in 1794.

* * *

ACKNOWLEDGMENT.

We are greatly indebted to Mr. VERNON S. FORBES of the Department of Geography of Rhodes University, who has spared no pains in providing us with geographical and other information. He has also drawn our attention to the incorrect statement as to the position of the Assegai Bosch.

Further we have to thank the Upsala University Library for kindly presenting us with microfilms of the two passages of SPARRMAN's letters reproduced herewith.

'N EMBRIOLOGIESE STUDIE VAN THEMEDA TRIANDRA FORSK.

deur

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ABSTRACT.

The development of the ovule, embryo sac, embryo and fruit of *Themeda triandra* Forsk. has been examined.

The form of the ovule is definitely unlike any standard type and may be referred to as modified campylotropous. The ovule is invested by 2 integuments, has a very broad insertion region and is sessile. The nucellar epidermis, in the region of the micropyle, undergoes periclinal divisions and becomes 4 to 6 layered. The outermost layer of cells becomes glandular and papillate. Of the nucellus only the nucellar membrane persists in the ripe caryopsis. The outer integument is feebly developed and even the inner one does not cover the apex of the nucellus. Both are obliterated in the ripe caryopsis.

Occasionally 2 macrospore mother cells were observed in the nucellus. The embryo sac is of the Normal type and several embryo sacs may be found in the ovule. The antipodal cells become glandular, increase in size and number and some may show up to 3 or more nuclei.

The development of the endosperm is nuclear. The aleurone layer, the outermost layer of the endosperm, is single and comprises the only cells of the endosperm left between the embryo and pericarp.

Only the earliest divisions of the proembryo could be followed. An epiblast and ventral scale is lacking. Polyembryony was observed in a few cases.

INLEIDING.

Oor die embriologie (insluitende die ontwikkeling en bou van die saad) van *Themeda triandra* Forsk is nog niks gepubliseer nie.

Die soort is wyd versprei in die Unie van Suid-Afrika en beslaan veral groot gedeeltes van die Somerreënstreke. Dit kom ook verspreid in die Winterreënstreek voor. Die materiaal wat gebruik is, is versamel op die ou gholfbane op die vlakte om Stellenbosch in die Winterreënstreek. (Vgl. *Themeda triandra* var. *hispida* (Nees) Stapf, nr. 21871 in Ste) Die aanlegte van die saadknoppe is gevind in materiaal wat in Mei en Junie versamel is. Die volwasse saadknoppe is gevind in Julie en ryp vrugte teen die end van Augustus.

Vrugbeginsels van alle ouderdomme is gefikseer in F.A.A., ingebed in paraffienwas en gemikrotomeer. Die deursneë is gekleur met Delafield se haematoxylin of met safranin en „fast green". Met die dubbelverf was die differensiasie onskerp. Om die kutikulas beter aan te toon, is deursneë wat eers in Delafield se haematoxylin gekleur is, vir 5-10 minute in Sudan III geplaas en daarna in gliserien-jellie gemonteer.

ONTWIKKELING EN BOU VAN DIE SAADKNOP EN KIEMSAK

Die saadknop ontstaan as 'n uitbulting van die vrugwand min of meer reghoekig met die lengte-as van die vrugbeginsel (Fig. 1). Op hierdie stadium verskyn ook reeds die anlages van die integumente en word die nucellus dus afgebaken. Die jong saadknop buig egter spoedig asgevolg van 'n versnelling in die groei in die basale gedeelte van die nucellus, deur byna 90° sodat sy lengte-as omtrent parallel verloop met dié van dié vrugbeginsel.

Die nucellus-epidermis ondergaan periklinale verdelings gedurende die ontwikkeling van die saadknop en op hierdie wyse word die kerntepel 4 tot 6 sellae dik. Hierdie selle is gewoonlik in vertikale rye gerangskik en die aan die buitenste oppervlakte vergroot veral sterk, die punte raak dikwels geboë en die selle word baie ryk aan protoplasma (Fig. 2.)

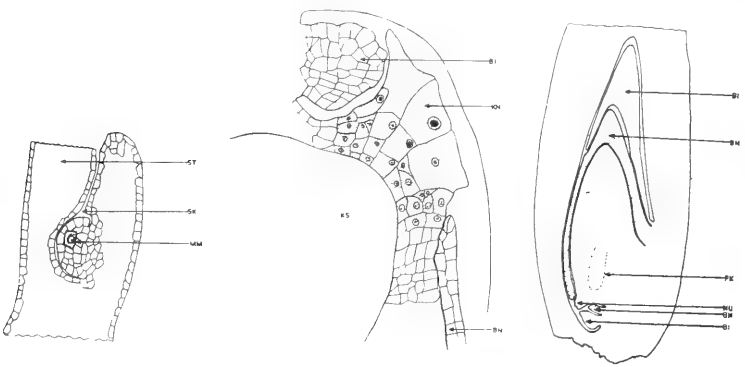

Fig. 1. Fig. 2. Fig. 3.

Fig. 1. Deursnee van die vrugbeginsel om die anlage van die saadknop met die makrospoormoedersel te toon. MM, makrospoormoedersel; SK, stylkanaal; ST, styl. × 225.

Fig. 2. Mikropilêre gedeelte van die saadknop om die klieragtige selle van die nucellus-epidermis te toon. BI, butenste integument; BN, binneste integument; KN, klieragtige nucellusselle; KS, keimsak. × 450.

Fig. 3. Deursnee van die vrugbeginsel om die gemodifieerde kampilotrope saadknop te toon. BI, buitenste integument; BN, binneste integument; NU, klieragtige deel van die nucellus; PK, posisie waarin keimsak min of meer sou lê. × 100.

Die saadknop is sittend en besit 'n breë basis (Fig. 3). Die inplanting van die saadknop is soos dié van 'n ortotrope en 'n raphe ontbreek. Dit kan dus nie as hemitroop beskryf word nie en die beste is om te sê dat die saadknop gemodifieerd kampilotroop is.

Die buitenste integument omring die saadknop slegs gedeeltelik en alhoewel die binneste integument die saadknop vir 'n groter gedeelte omring, is dit ook nog nie volledig nie.

Albei die integumente bestaan vir die grootste gedeelte uit 2 of 3 lae selle. Aan die kant naaste aan die styl vertoon albei die integumente egter 'n opvallende verdikking en bestaan hulle albei hier uit 15 of meer lae selle (Fig. 3).

In die jong saadknop bestaan albei die integumente uit dunwandige, parenchymatiese selle. Daar is ook nog geen kutikulas waar te neem nie. Ten tyde van bevrugting is daar reeds 'n duidelike kutikula te onderskei tussen die binneste integument en die nucellus. Die kutikula strek ook oor die klieragtige selle van die nucellus-epidermis. Tussen die twee integumente en op die buitenste integument kon geen kutikula waargeneem word nie.

'n Hypodermale sel funksioneer direk as makrospoormoedersel en 'n primêre parietale sel is nooit waargeneem nie.

In teenstelling met die meeste lede van die Gramineae wat ondersoek is, word by *T. triandra* dikwels meer as een archespoorsel gevind in 'n saadknop—gewoonlik 2 (Fig. 4). Die archespoorsel verdeel twee maal namekaar om 'n lineêre tetrade van 4 makrospore te vorm. In Fig. 5 word 2

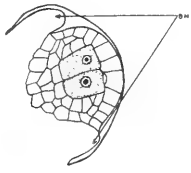

Fig. 4.

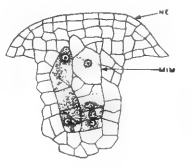

Fig. 5.

Fig. 4. Deursnee om jong saadknop met 2 makrospoormoederselle te toon. BN, binneste integument. × 600.

Fig. 5. Gedeelte van die nucellus om twee tetrades van makrospore te toon. MIM, mikropilêre makrospoor; NE, nucellusepidermis. × 450.

tetrades van makrospore aangetoon wat langs mekaar lê. Gewoonlik is die tetrades parallel geleë met die lengte-as van die saadknop, maar in een geval is ook 'n horisontale tetrade gevind (Fig. 6).

Fig. 6.

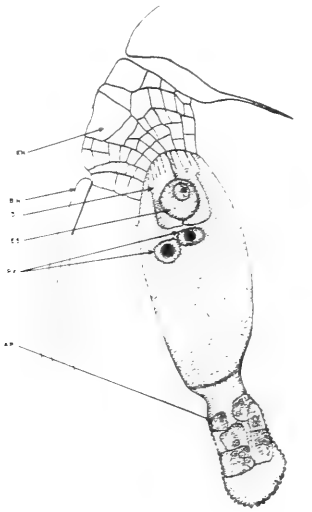

Fig. 7.

Fig. 6. Deursnee van saadknop om horisontale tetrade van makrospore te toon. × 850.

Fig. 7. Kiemsak ten tyde van bevrugting. AP, antipodale selle; BN, binneste integument; ES, eier; KN, klieragtige nucellusselle; PK, poolkerne; SI, sinergide. × 375. (Hierdie tekening is die samevoeging van verskeie deursneë).

Die chalazale makrospoor vergroot gewoonlik en die kern verdeel verder om die kiemsak te vorm. Die orige 3 makrospore gaan sover vasgestel kon word, spoedig te gronde. In enkele gevalle is egter ook waargeneem dat die mikropilêre makrospoor vergroot.

In die volwasse saadknop word daar dikwels meer as een kiemsak gevind, selfs meer as 4, en hulle is gewoonlik net onderkant die klieragtige selle van die nucellus-epidermis geleë. Op welke wyse meer as een kiemsak ontstaan, kon nie vasgestel word nie. Waarskynlik ontwikkel die kiemsakke uit afsonderlike makrospore en dit is moontlik dat die makrospore van verskillende tetrades afkomstig is. In saadknoppe met meer as een kiemsak toon gewoonlik slegs een kiemsak, gewoonlik die een naaste aan die mikropiel, die bou en rangskikking van kerne wat in die normale kiemsak aangetref word.

Die kern van die funksionerende makrospoor verdeel en die twee kerns migreer na die teenoorgestelde pole van die kiemsak. Die volwasse kiemsak (Fig. 7) bevat 'n eierapparaat, twee polare kerns en 'n aantal antipodale selle. Die eier is bolvormig. Die twee sinergide is langwerpig, 'n

„Fadenapparat" is gewoonlik te onderskei en die onderpunte is soms haakvormig. Die sinergide begin vroeg te degenereer, dikwels reeds voor bevrugting. Die twee poolkerne versmelt na bevrugting en voor of tydens dubbelbevrugting. Een kern met twee nucleoli in die plek van die twee polare kerns is geinterpreteer as 'n sekondêre kiemsakkern. Die antipodale punt is nou en afgesnoer van die res van die kiemsak. Die getal antipodale selle varieer van 4—8. Die selle is plasmaryk en elk met drie of meer kerne. Voor die selle verdwyn, word hulle eers gevakuoliseerd.

DIE ENDOSPERM EN EMBRIO

Die endosperm is nukleêr en die eerste verdelings van die primêre endospermkern gaan nie gepaard met selwandformasie nie. Die verdeling van die primêre endospermkern gaan altyd dié van die sigoot vooraf. In die kiemsak waarvan Fig. 8 'n weergawe is, is daar ongeveer 30 endospermkerne aanwesig, terwyl die sigoot nog net een verdeling ondergaan het. Die sigoot gaan dus 'n rusperiode in, terwyl die primêre endospermkern dadelik begin verdeel.

Die vrye endospermkerne is geleë aan die periferie van die kiemsak en is ingebed in 'n laag sitoplasma. Selwandformasie begin rondom die embrio en brei antipodaalwaarts uit. Die selle van die buitenste laag van die endosperm deel periklinaal terwyl die verdelings van die binneste selle taamlik onreëlmatig is. Uiteindelik is ook die sentrale gedeelte van die kiemsak gevul met groot selle, terwyl aan die periferie van die endosperm waar seldeling vinnig plaasvind, die selle baie klein is. Die verdere ver-

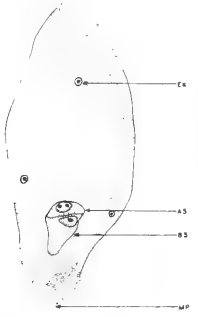

Fig. 8.

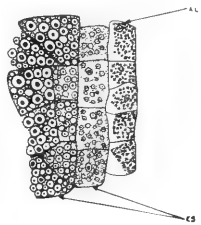

Fig. 9.

Fig. 8. Kiemsak om 2-sellige pro-embrio en vrye endospermkerne aan te toon. AS, apikale sel; BS, basale sel; EK, endospermkern; MP, mikropilêre punt van kiemsak. ×450. (In die kiemsak waarvan die deursnee hier geteken is, was daar ongeveer 30 endospermkerne).

Fig. 9. Gedeelte van die endosperm van die volwasse vruggie. × 600. AL, aleuroonlaag; ES, endospermselle met setmeel.

delings van die endospermselle is ook beperk tot die buitenste een of twee lae. In die volwasse vrug is die selle van die endosperm volgepak met setmeelkorrels en is net die aleuroonlaag heel buite-om vry van setmeel (Fig. 9). Die aleuroonlaag bestaan uit 'n enkele laag taamlike reëlmatige selle wat ook buite-om die embrio strek.

Die eerste verdeling van die sigoot is transversaal en 'n klein apikale sel en 'n groter basale sel word aldus gevorm. (Fig. 8). Die eerste verdeling van die sigoot word gevolg deur 'n vertikale verdeling van die apikale sel en 'n transversale verdeling van die basale sel (Fig. 10). Die verdeling van die basale sel geskied deur middel van 'n skuins wand en op dié manier ontstaan 2 selle, die een waarvan baie groter as die ander is. Dit lyk volgens fig. 11 asof die volgende verdeling van die apikale sel ook vertikaal is, maar dat die verdelingsvlak reghoekig staan ten opsigte van die eerste een. Die daaropvolgende verdelings van die sigoot is nie gevind nie.

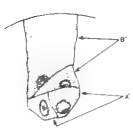

Fig. 10.

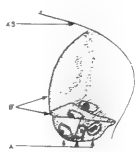

Fig. 11.

Fig. 12.

Fig. 10. 4-sellige pro-embrio. A', selle gevorm deur eerste verdeling van apikale sel; B', selle gevorm deur eerste verdeling van basale sel. × 600.

Fig. 11. 6-sellige pro-embrio. A', selle gevorm deur eerste twee verdelings van die apikale sel; B', selle gevorm deur die eerste verdeling van die basale sel; KS wand van kiemsak. × 600.

Fig. 12. Jong embrio. AD', selle gevorm deur delings van die apikale sel; BD, selle gevorm deur delings van die basale sel; SS, selle van die suspensor. × 575.

Die groei van die embrio vind veral vinnig plaas in die apikale streek, terwyl in die basale streek (in die streek van die suspensor) min selverdelings plaasvind, met die gevolg dat die embrio ontwikkel in 'n knuppelvormige struktuur. (Fig. 12).

Aan die een kant van die embrio, taamlik na aan die basis, ontstaan 'n effense uitsakking wat die onderste grens van die skutellum aandui. Aan die teenoorgestelde kant en min of meer op dieselfde hoogte ontstaan daar 'n bultjie wat die primordium van die stingeltop is. Die koleoptiel ontstaan as 'n weefselring wat die groeipunt van die stingel omsluit (Fig. 13). Die boonste gedeelte van die weefselring (Fig. 13, Kol. 1), groei vinniger as die

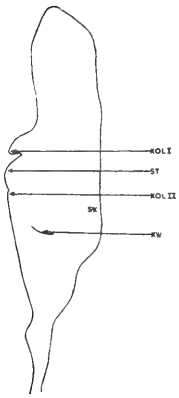

FIG. 13.

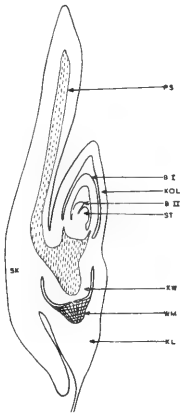

FIG. 14.

FIG. 13. Die jong embrio. KOL I & KOL II, anlage van die koleoptiel; KW, kiemworteltjie; SK, skutellum; ST, stingeltop. × 275.

FIG. 14. Die volwasse embrio. B I & B II, eerste 2 blaartjies van die pluimpie: KL, koleorhiza; KOL, koleoptiel: KW, kiemwortel; PS, procambiumstring; SK, skutellum; ST, stingelpunt; WM, wortelmussie. × 125.

onderste gedeelte en uiteindelik vergroei dit aan die top met die gevolg dat die koleoptiel dan 'n geslote struktuur is (Fig. 14). Die kiemworteltjie word op 'n vroeë stadium (Fig. 13), uit die ongedifferensieerde weefsel tussen die koleoptiel en suspensor gevorm. Dit is by sy ontstaan omsluit deur die koleorhiza wat aaneenlopend is met die koleoptiel. Gedurende die ontwikkeling van die pluimpie en kiemworteltjie vergroot die skutellum vinnig en in die volwasse saad omsluit dit die pluimpie en kiemworteltjie feitlik geheel en al.

Oor die algemeen bevat elke vrug net een embrio, maar in enkele gevalle is daar twee embrios in dieselfde vrug, ingebed in afsonderlike massas endosperm, gevind.

DIE ONTWIKKELING VAN DIE SAAD EN VRUG

Gedurende die groei en ontwikkeling van die endosperm en embrio, disorganiseer die selle van die nucellus. Dié rondom die kiemsak is die eerste om te degenereer, maar verwording brei vinnig uit oor die hele nucellus sodat groot oop ruimtes ontstaan. Die integumente begin ongeveer gelyk met die nucellus te verword—die buitenste integument is die eerste om te verdwyn. Ook die binneste integument begin spoedig tekens van degenerasie toon. Die selwande verdwyn eerste en hulle laat 'n plas-

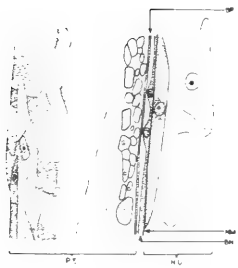

Fig. 15.

Fig. 16.

Fig. 15. Gedeelte van die perikarp van die jong kariopsis met aangrensende nucellus BN, binneste integument, besig om te verword; NM, kutikula van die nucellus; NU, verworde nucellus; PE, perikarp; BP, binneste laag van die perikarp waarin geen selle meer onderskei kan word nie. × 55.

Fig. 16. Wand van die vrugbeginsel ten tyde van bevrugting. BE, binneste epidermis van perikarp. × 575.

modium met talryke kerne agter (Fig. 15), wat ook geleidelik verdwyn. Al wat van die nucellus en integumente in die ryp kariopsis oorbly, is 'n dun vormlose membraan (Fig. 17). Hierdie membraan kleur rooi met Sudan III, is verkurk en bevat vermoedelik ook die oorspronklike kutikula van die nucellus alhoewel die kutikula nie meer onderskei kan word nie. *T. triandra* het dus in werklikheid geen saadhuid nie, behalwe as hierdie dun membraan as saadhuid ge-interpreteer word.

Die wand van die volwasse vrugbeginsel (ten tyde van bestuiwing) is parenchymaties en 10—12 sellae in deursnee. (Fig. 16). Na buite is twee tot drie lae baksteenvormige selle wat vertikaal effens verleng is. Die selle van die daaropvolgende vyf tot sewe lae is effens meer ovaalvormig. Hulle word gevolg deur een tot twee lae selle wat horisontaal verleng is sodat hulle lang-asse kruis met die lang-asse van die aangrensende selle. Hierdie selle grens teen die binneste opperhuid wat uit lang, nou selle bestaan en in dieselfde rigting soos die selle van die buitenste lae verleng is.

Die meristematiese aktiwiteit in die vrugbeginselwand eindig na bevrugting. Die vrugbeginsel hou egter aan met groei en neem veral toe in lengte. Deur selstrekking hou die binneste sowel as die buitenste paar lae van die perikarp tred met hierdie verlenging. Die selle in die middelste lae gaan spoedig tot niet (Fig. 17), en word die binneste en buitenste gedeeltes van die perikarp teen mekaar gedruk. Die oorblywende selle word platgedruk en hul wande verhout. Die verhoute selle, waarvan die selgrense beswaarlik bepaal kan word, bevat talryke stippels (Fig. 18).

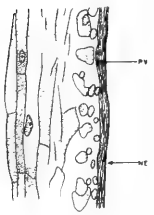

FIG. 17.

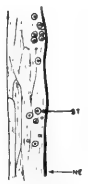

FIG. 18.

FIG. 17. Perikarp waarvan binneste paar lae reeds verhout het. NE, membraan gevorm deur nucellus en integumente; PV, gedeelte van die perikarp waar van die selwande reeds verhout het en die selgrense nie meer te onderskei is nie. × 555.

FIG. 18. Perikarp van volwasse kariopsis. NE, membraan gevorm deur nucellus en integumente; ST, stippels gevind in die binneste lae van die perikarp. × 555.

BESPREKING

Die saadknop, kiemsak, endosperm, embrio of vrug van 'n aantal soorte, meestal ekonomies-belangrike soorte, van die Gramineae is alreeds ondersoek. Die gegewens is egter onvoldoende om die embriologiese kenmerke van die twee subfamilies, Panicoideae en Poacoideae, of van die verskillende tribusse, behoorlik te omskryf.

Pilger (1940) plaas *Themeda* in die tribus Andropogoneae in die subfamilie Panicoideae. Lede van die Panicoideae wat reeds embriologies ondersoek is, is o.m. *Saccharum* (Artschwager, 1929), *Pennisetum* (Khosla, 1946; Narayanaswami, 1955), *Setaria* en *Panicum* (Khosla, 1946), *Echinochloa* (Narayanaswami, 1955), *Zea* (Miller, 1919; Randolph, 1936). Van die genoemde genera behoort net *Saccharum* tot die Andropogoneae.

Die saadknop van *Themeda* kom in hoofsaak ooreen met dié van ander lede van die Panicoideae. Daar is egter afwykings.

Die saadknop van *Themeda* kan beskryf word as gemodifieerd kampilotroop, 'n omskrywing wat Miller (1919) ook op die mielie toepas. Randolph (1936) noem die saadknop van die mielie semi-anatroop. Artschwager (1929) beskryf die saadknop van *Saccharum* as anatroop. Soos by die meeste ondersoekte soorte, uitgesonderd *Panicum* (Khosla, 1946), word die saadknop slegs gedeeltelik deur die buitenste integument omsluit. Soos by *Pennisetum typhoideum* (Narayanaswami, 1953), maar anders as by die ander Gramineae, strek die binneste integument ook nie tot oor die top van die nucellus nie. 'n Uitsonderlike kenmerk is dat beide die buitenste en die binneste integument aan die kant van die saadknop naaste aan die styl, talryke sellae in deursnee is (20—40 in die buitenste en 10—15 in die binneste).

Meer as een archespoorsel, soos by *Themeda*, is ook al gevind by *Poa pratensis* (Andersen, 1927; Nielsen, 1946) en *Oryza sativa* (Kuwada, 1910—fide Schnarf, 1929). By *Poa* (Andersen, 1927; Engelbert, 1941; Håkansson, 1943; Nielsen, 1946) en *Echinochloa frumentacea* (Narayanaswami, 1955) is, soos by *Themeda*, meer as een kiemsak in 'n saadknop gevind.

Die bou van die kiemsak kom baie ooreen in die verskillende soorte wat ondersoek is. Die verskille is veral ten opsigte van die antipodale selle—hul posisie, getal en die getal kerne in elke sel. By die Panicoideae is die kiemsak reguit en lê die antipodale selle in die punt van die kiemsak, soos by *Themeda*. By die Poacoideae lê die antipodale selle teen die sy van die kiemsak (Schnarf, 1931).

Die ontwikkeling en bou van die endosperm kom ooreen met die van ander ondersoekte soorte. Die aleuroonlaag is gewoonlik een sellaag in deursnee soos by *Themeda*. By *Pennisetum* (Narayanaswami, 1953), *Poa* (Andersen, 1927) en *Saccharum* (Artschwager, 1929) is die aleuroonlaag soms twee sellae in deursnee.

Die endosperm begin te vorm voordat die sigoot verdeel. Nielsen (1947) het gevind dat by apomiktiese soorte van *Poa pratensis* die embrio al ver ontwikkel het voordat die primêre endosperm begin verdeel en dat by nie-apomiktiese soorte die endosperm voor die delings van die sigoot, begin te vorm.

Die eerste delings van die sigoot is soos by die ander Gramineae wat ondersoek is. Poli-embrionie kom soms by *Themeda* voor, maar hoe die poli-embrionie ontstaan, is nie bepaal nie. Poli-embrionie is by verskeie Gramineae gevind en Nielsen (1946) noem verskeie maniere waarop poli-embrionie by *Poa pratensis* kan ontstaan.

Themeda is sonder 'n epiblast. Volgens Bruns (1892) is die afwesigheid van die epiblast kenmerkend vir die Andropogoneae en die meeste tribusse van die Panicoideae. 'n „Ventral scale", soos Avery (1930) by *Avena sativa* en *Triticum vulgare* gevind het, kom ook nie voor nie.

Die absorpsie van die nucellus gedurende die ontwikkeling van die saad en vrug is algemeen by die Gramineae wat ondersoek is. Die absorpsie van beide integumente is egter buitengewoon, maar is reeds waargeneem deur Narayanaswami (1953) by *Pennisetum typhoideum* en, volgens Randolph (1936), ook by die mielie. In soverre by *Themeda* van 'n saadhuid gepraat kan word, bestaan dit uit 'n vormlose vlies gevorm uit die oorblyfsels van die nucellus en integumente. Die perikarp vorm die belangrikste beskerming vir die embrio.

Die bou en ontwikkeling van die perikarp kom ooreen met dié van die mielie soos beskrywe deur Randolph (1936).

ERKENNING.

Die artikel is gebaseer op resultate verkry deur navorsing wat gedoen is as vereiste vir die M.Sc.-graad van die Universiteit van Stellenbosch. Hiermee betuig ek my dank aan prof. P. G. Jordaan, Departement van Plantkunde, Universiteit van Stellenbsoch, vir die leiding en aanmoediging wat ek van hom ontvang het gedurende die loop van die ondersoek. My hartlike dank ook aan dr. M. P. de Vos, Senior Lektrise in Plantkunde, vir die hulp en raad aan my verleen.

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